PROJECT MANUAL

DES MOINES INTERNATIONAL AIRPORT
LIFT DSM PASSENGER TERMINAL
DES MOINES, IOWA

DSM PA AND EVIDS SYSTEM REPLACEMENT
100% DESIGN
May 23, 2025

VOLUME 1
DIVISION 27

HNTB Iowa Inc. / HNTB Corporation

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KANSAS CITY, MO 64105
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Division	Section Title	Issue Date 100% DESIGN	Revision Date

VOLUME 1

PROCUREMENT AND CONTRACTING DOCUMENTS GROUP

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

SPECIFICATIONS GROUP

General Requirements Subgroup

DIVISION 27 – COMMUNICATIONS

END OF TABLE OF CONTENTS

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_____ (SEAL)

I, Matthew Hendel, hereby certify that the documents intended to be Authenticated by my seal are limited to:

Certified specification sections include the following:
27 0105, 27 0500, 27 4216, 27 5116

Certified drawings include the following:
TA0-001, TA0-002, TA0-100, TA1-B01-001, TA1-B01-002, TA1-B01-003, TA1-B01-101, TA1-B01-102, TA1-B01-103, TA1-B01-104, TA1-B01-105, TA1-B01-106, TA1-B01-107, TA1-B01-108, TA1-B01-109, TA1-B01-110, TA1-B01-201, TA1-B01-202, TA1-B01-203, TA1-B01-204, TA1-B01-205, TA1-B01-206, TA1-B01-207, TA1-B01-208, TA1-B01-209, TA1-B01-210, TA1-B01-302, TA1-B61-101, TA1-B70-101, TA4-B01-001, TA4-B01-002, TA4-B01-003, TA4-B01-004, TA6-001, TA6-002, TA7-001, TA7-002, TA7-003

EACH PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS ABOVE ASSUMES RESPONSIBILITY IN THESE BIDDING DOCUMENTS ONLY FOR WHAT IS LISTED ABOVE AND DISCLAIMS ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE SIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT.

SECTION 27 01 05 – INVESTIGATION OF EXISTING COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Contractual Conditions and Division 01 Specification sections apply to this Section.

1.2 STIPULATIONS

A. Related Specification Sections:

1. Refer to Specification Section 27 05 00 for requirements.

1.3 SCOPE

A. Test the essential features of the following existing communications systems:

1. Electronic Visual Information Display System
2. Public Address System

B. Each system shall be tested once only, and after completion of testing, results shall be documented and given to the Owner and A/E Consultant. Point out any non-operational function noticed during testing.

C. Document the existing conditions and operation of the existing systems prior to any work.

D. Contractor is responsible for all non-working systems and their components unless the non-working status is documented during initial testing and verified prior to work beginning on the system.

1.4 TIME

A. The testing shall be held on a date to be agreed upon in writing by the Owner.

1.5 ATTENDING PARTIES

A. The testing shall be held in the presence of Owner, or his representative and the Contractor.

PART 2 - PRODUCTS (NOT APPICABLE)

PART 3 - EXECUTION

3.1 PERFORMANCE VERIFICATION

A. Test the operation of each of the following existing systems and associated devices and provide documentation indicating findings:

1. Electronic Visual Information Display System
   a. Test each display (LCD and LED displays) and its associated DDC, video splitter, or current interface into the existing system. Note the content being displayed and record location of each tested device and note whether operational or non-operational. The same content at each location shall be replicated in the new system.

b. Test each tugman input device and its associated functionality that shall be replicated in the new system. Record location of each tested device and note whether operational or non-operational.
c. Test PA interface and document functionality which shall be replicated.
d. Test CUTE interface and document functionality which shall be replicated.
e. Verify OAG Flight aware interface is operational and document functionality which shall be replicated.
f. Verify network configuration and existing IP addresses including LAN switch locations.

2. Public Address System
   a. Test each microphone station and speaker zone, verify voice path operation. Record location of each tested device and note whether operational or non-operational.
   b. Test paging system sufficiently to determine the existing operating condition of system.
   c. Test ambient sensors for configuration and functionality.
   d. Check for call-in annunciation and communication for messaging.
   e. Identify and record any existing speaker circuit malfunctions. Any failing cable which is identified to be reused shall be replaced. Test to include:
      1) Ground Faults
      2) Polarity check
      3) Existing Zone and Circuiting verification
      4) Continuity check.
   f. Test and confirm existing zoning configurations.
   g. Test fire alarm interface which shall be replicated.
   h. Test background music interface which shall be replicated.
   i. Test EVIDS interface and document functionality which shall be replicated.
   j. Verify network configuration and existing IP addresses.
   k. Investigate each comm room's UPS capacity to accommodate new equipment

B. The Contractor shall investigate and verify the performance of all existing systems as specified herein prior to the beginning of any work which could affect these systems.

C. Each system shall be retested after completion of the project to ensure proper operation is maintained.

1. Each system shall be tested once only, and after completion of testing, results shall be documented and given to the Owner. Point out any non-operational function noticed during testing.
2. Contractor is responsible for all non-working systems and their components unless the non-working status was documented during initial testing and verified prior to work beginning on the system.

3.2 MEMO OF INVESTIGATION (TESTING)

A. Submit Existing Facilities Investigation Memo (EFIM) and advise Owner and A/E Consultant of all deficiencies in system(s) prior to work. All systems will be assumed to be fully operational if the memo is not received by Owner and A/E Consultant prior to work on system.

B. Submit the EFIM signed by Owner and Contractor. Submit each test result to the Owner.

3.3 ATTACHMENTS

INVESTIGATION MEMO

NAME OF PROJECT: DSM PA AND EVIDS REPLACEMENT PROJECT

THE EXISTING SYSTEMS ON THE ABOVE PROJECT HAVE BEEN INVESTIGATED AND CHECKED TO DETERMINE THE EXISTING CONDITION OF ALL EXISTING ELECTRICAL SYSTEMS WITHIN THE AREA(S) AFFECTED BY THE SCOPE OF WORK OF THIS PROJECT. THE INVESTIGATION CONSISTED OF TESTING ALL ELECTRICAL SYSTEMS/DEVICES AS REQUIRED BY SECTION INVESTIGATION OF EXISTING ELECTRICAL SYSTEMS OF THESE SPECIFICATIONS.

ALL EQUIPMENT WAS FOUND TO BE PERFORMING AS DESIGNED AND INTENDED EXCEPT AS NOTED HEREIN (LIST BELOW):

NAME OF CONTRACTOR:

AUTHORIZED SIGNATURE AND TITLE:

DATE:

NAME OF OWNER AND/OR AUTHORIZED REPRESENTATIVE:

AUTHORIZED SIGNATURE AND TITLE:

DATE:

NOTE TO CONTRACTOR: UPON COMPLETION OF INVESTIGATION AND ONE WEEK PRIOR TO THE COMMENCEMENT OF WORK, SUBMIT FIVE COPIES OF THE COMPLETED EXISTING FACILITIES INVESTIGATION MEMO TO THE OWNER'S AUTHORIZED REPRESENTATIVE, SIGNED AND DATED BY CONTRACTOR. HAVE THE OWNER'S AUTHORIZED REPRESENTATIVE SIGN AND DATE RECEIPT OF MEMO. RETAIN COPY(IES) AND SUBMIT COPY OF MEMO IN EACH OPERATION AND MAINTENANCE MANUAL. CONTRACTOR SHALL SUBMIT QUANTITIES OF MEMOS AS REQUIRED TO PRESENT REQUIRED INFORMATION.

END OF SECTION 27 01 05

SECTION 27 05 00 - COMMON WORK ELEMENTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 STIPULATIONS

A. Project drawings and general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections and stipulated Specification Sections shall apply to this and all related Division 27 Specification Sections.

B. Related Specification Sections:

1. 27 01 05 – Investigation of Existing Communications Systems
2. 27 42 16 – Electronic Visual Information Display System
3. 27 51 16 – Public Address and Emergency Communication System

C. Reference Symbols:

1. All device symbols are defined by the appropriate symbol schedule on the symbols and abbreviations sheet in the Technology Systems Contract Drawings. Not all device symbols as indicated may be required for the project.
2. Because of the scale of the drawings, symbols are shown on drawings as close as possible to the existing locations and based on as-builts provided and a site visit. Contractor shall confirm exact locations of all components with all related Contract drawings and specifications prior to submittal of shop drawings.

D. Abbreviations: Refer to sheet TA0-002

E. Definitions:

1. Contract Documents: The documents consisting of the Form of Agreement between Authority and Contractor, Conditions of the Contract, (General, Supplementary, and other Conditions), Drawings, Specifications and all Addenda issued prior to the execution of the Contract.
2. Contract Drawings: The drawings that form a part of the Contract Documents that provides the graphical representation of the project requirements intended design and/or performance criteria to be delivered by the Contractor.
3. Reference Drawings: A drawing and/or set of drawings produced by a proprietary supplier, manufacturer, subcontractor, or fabricator included in the Contract Documents for informational purposes, providing specific information related to the installation of related appurtenances, components, devices, hardware, products, and/or systems. Reference Drawings shall also include any Contract Drawings from prior bid packages that may have pertinent information or require coordination of trades related to this contract.
4. Shop Drawings: A drawing and/or set of drawings produced by the contractor, supplier, manufacturer, subcontractor, or fabricator as a detailed representation of the proper installation of the related, appurtenance, component, device, hardware, product, and/or system to be delivered in conformance to the requirements of the Contract Documents.
5. The Authority: Des Moines Airport Authority (DMAA) (Owner).

6. Contractor: The Technology Systems Contractor.
7. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
8. Install: Receive, Unload, verify, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
9. Provide: Furnish and install, complete and ready for the intended use.

1.2 SUMMARY

A. This Section contains the overall requirements associated with all related Division 27 and for all network communication cabling and equipment related to the installation of the following systems:

1. Electronic Visual Information Display System (also referred to as FIDS)
2. Public Address / Paging System

B. In addition to the requirements of Division 1, this section shall address further requirements for submittals, quality assurance, product handling, record documents, project conditions, installation, system performance, demonstrations, testing, and certifications for all scopes of work related to network communication cabling for this project scope of work. Refer to related Division 27 specification sections and all contract drawings for additional requirements.

C. It shall be the responsibility of the Contractor to furnish and install any necessary cabling, conduits/raceways, cable terminations, controls, systems, materials, devices, components, and software as well as all appurtenances, programming, commissioning and testing necessary to deliver a complete and fully operational communications network infrastructures and systems as indicated by the contract documents.

D. The installation, performance, features, functions, software, licenses, and programming criteria as specified herein as well as all related drawings and Division 27 specification sections have been designed to offer the maximum system efficiency, ease of operation, occupant safety and the protection of equipment as recommended by the Authority.

1. Any deviations from the specified criteria shall be documented, reviewed, and agreed to in writing by the Authority prior to submission of bids. Refer to Division 01, and all related Division 27 Specification Sections for any substitutions and/or project deviation requests.
    a. The required information shall include but not be limited to: reason for deviation, all differences in performance, operation, and function from the herein specified requirements, all benefits, and added features to the Authority as a result of the deviations and any additional incurred costs to the Authority for maintenance and long term ownership.
    b. Failure to provide the Authority with the required information shall result in any shop drawing submissions being returned for non- conformance with the contract requirements.

2. The submission of a bid or proposal for this work shall serve as acknowledgement that the Contractor and all Sub-Contractors have read, understood and accepted all of the General Conditions, Special Requirements, General Requirements, and all related specification sections and in the execution of all work shall be bound by all of the conditions and requirements therein.
    a. Prior to the submission of a Bid or proposal for this work, all anomalies, inaccuracies, discrepancies or inconsistencies noted within these Contract Documents shall be brought to the immediate attention of the Authority in written form. The submission of a bid or proposal for this work shall serve as acknowledgement that, apart from any such anomalies, inaccuracies, discrepancies or inconsistencies noted, the Contractor and all Sub-Contractors believe the Contract Documents to be complete and sufficient to provide a complete and fully-functional project as intended by the Authority.
    b. During the execution of all work, the Contractor shall immediately notify, in written form, the Authority of any and all anomalies, inaccuracies, discrepancies or inconsistencies discovered within the Contract Documents. The Authority shall not be responsible for any additional costs associated with correcting any such anomalies, inaccuracies, discrepancies or inconsistencies incurred as a result of a delay by the Contractor in notifying the Authority of any such discovery.
    c. Where ambiguity exists within the Contract Documents, the most stringent requirement and/or that which is superior in system design and performance shall prevail and shall be delivered by the Contractor at no additional expense to the project.

E. All device symbols are defined by the appropriate symbol schedules as indicated by the symbol and abbreviation drawing sheets for each discipline. The Contractor shall coordinate exact locations with all architectural, mechanical, electrical, reflected ceiling, furniture drawings and door hardware specifications as well as all affected trades prior to submittal of bids.

1. All symbols are shown on the contract drawings as close as possible to their existing and/or intended location. Contractor shall coordinate with the Authority the installation of all equipment, devices, controls, components, cabling conduits/raceways and integration of other systems along with any other all affected trades and specified system sub-contractors. The contractor shall document all coordination requirements at the time of shop drawing submission.
2. Drawings for this work are diagrammatic and intended to convey the extent, general arrangement, and locations of the work. Because of the scale of the drawings, certain basic items such as access panels, conduits, cabinet sizes, penetration sleeves, pull boxes, back-boxes and junction boxes may or may not be shown on the contract drawings. Include all items where required by code and related specification sections for proper installation of all work.

F. Project specifications and drawings may not deal individually with every part, control, device, component, or appurtenance which may be required to produce the equipment performance for the specified system and/or as required for compliance with all specified systems integration.

1. Include such items and components, as required, for complete operational systems as defined by the project documents, whether specifically indicated or not. Subject to the responsibility matrices shown on the Contract Drawings, the Contractor shall be responsible for providing conduits/raceways, cable terminations, controls, systems, equipment, materials, devices, components, electrical power, equipment racks/cabinets, software, programming, commissioning, testing and all appurtenances as well as the integration of any ancillary systems or Authority provided equipment/components/systems.
2. Coordinate with any other applicable trades in submittal of shop drawings and the installation of all systems. All shop drawings shall detail space conditions in order to accommodate other concerned trades, all equipment locations are subject to final review by the Authority.

G. All Division 27 scopes of work shall include all necessary labor, coordination and interfacing with other trades and existing systems, software, equipment, materials, devices, cabling, conduits and electrical power as well as the performance of all system programming, testing and commissioning as required to provide fully operational systems in accordance with all requirements of the project documents.

1. Coordinate the installation of all systems, equipment, components, materials, conduits, cabling, devices and all existing system modifications with the Authority prior to the submission of any shop drawings.
2. All Division 27 systems work shall include the labeling of all wire terminations, cabling, patch cords, pathways, enclosures, racks and cabinets in accordance with the Authority labeling standards, requirements and guidelines. All wiring shall terminate on fixed terminal strips, punch blocks, or patch panels in accordance with all requirements of the project drawings and related specifications.
    a. No splices shall be permitted in non-accessible junction boxes. All junction boxes containing any system splices shall be uniquely identified.
    b. All mounting heights and accessibility to all equipment requiring access by individuals with disabilities shall comply with ANSI A117.1 requirement.
    c. All interior devices exposed to the general population shall be installed in secured equipment enclosures and installed in such a manner that resists tampering and/or removal without the use of specialized tools.
3. All work shall be neat in appearance, free of rough edges, scratches, blemishes, cracks and exposed gaps. All equipment shall be secured to the mounting surface and fastened with hardware approved by the manufacturer and capable of supporting the rated load. All backbone/permanent cables within enclosures shall be neatly routed and tie wrapped at 6 inches on center. Patch cables shall be secured with hook-and-loop (Velcro) or wire management guides. All wire splices shall be terminated on terminal strips and/or soldered in place. Any splices utilizing wire nuts or crimp/pressure-type connectors shall not be acceptable.

H. Use of Premises

1. Refer to Specification Section 01 10 00 in addition to the following.

2. The Contractor shall design, prepare, schedule, and coordinate all scopes of work without disruption of any existing system functions or the daily operation of the existing facility. All cabling and equipment shall be installed in such a manner that all new controls, equipment and/or devices shall be installed, programmed and tested prior to modification, switch over and/or disconnecting of any existing systems.
    a. Include all costs related to any phased construction methodologies having to do with the scope of work defined herein, including, but not limited to, all necessary temporary equipment, devices, components or systems as well as any labor costs associated with any installation, commissioning, testing demolition of any technology systems required to be performed outside of normal business hours of the facility, Contractor or Sub-Contractors.
    b. Prior to the disabling, modifications, switchover and/or demolition of any existing system components and/or cabling, all new system components, equipment, conduits, cabling, shall be in place, tested and fully operational.
    c. The contractor shall coordinate all installation activities so as not to disrupt the daily operations of the airport and shall include any costs related to a phased construction methodology where applicable. Installation activity and costs shall include but are not limited to all necessary temporary equipment, devices, components or systems as well as any labor costs associated with any installation, commissioning, testing demolition of any systems required to be performed outside of normal business hours of the facility, Contractor or Sub-Contractors.
3. Contractor shall plan, schedule and install all scopes of work in accordance with all requirements of the project construction schedule. Refer to related specification sections for additional information related to project scheduling and facility access.
    a. The contractor shall coordinate all installation and demolition activities so as not to disrupt the daily routine of the existing facility or negatively impact the integrity of the facility's security and life safety measures.

I. Coordination

1. The Contractor shall coordinate with any other affected trades in the submittal of comprehensive shop drawings and the installation of all equipment, devices, and systems. All shop drawings shall detail space conditions in order to accommodate all impacted trades, all equipment and device locations are subject to final review by the Authority.
    a. If installation of equipment, enclosures, raceways, cable trays and/or conduits is performed prior to submission and/or approval of shop drawings, the Contractor shall make any adjustments or corrections as indicated in the shop drawing review at no additional cost to the Authority.
    b. If installation of equipment, raceways, cable trays, and/or conduit is performed prior to coordination with all other trades, which interferes with work of other trades or the performance of the system, the contractor shall make necessary changes to correct the condition at no additional cost to the Authority.

2. Where applicable, contractor shall coordinate all service, rework, and relocation of existing utilities. Bid shall include all work required for any connections/interfacing with existing systems and/or utilities.
3. Coordinate all work involving tenant leased areas or equipment for rework, relocation, and addition of equipment and devices, including any modification to existing system infrastructures with the Authority.

1.3 SCOPE OF WORK

A. Refer to individual Specification Sections for further system requirements.

B. Refer to drawings sheet TA0-002 for work responsibility matrix and for any work provided by the Authority and/or Authority Vendors.

C. Authority-Furnished Equipment (Owner-Furnished Equipment (OFE))

1. Refer to the Technology Responsibility Matrices in the Contract Drawings for additional information.
2. The Contractor shall coordinate with the Authority for all Authority Vendor and OFE.
3. The Contractor shall coordinate with the Authority for pick-up of all OFE to be installed by the Contractor. The Contractor shall coordinate with the Authority in advance for specific pick-up location of OFE and to obtain access to such locations. The Authority shall not be responsible for delivery of OFE to be installed under this contract to the construction site. The hand-off of OFE between the Authority and the Contractor may occur multiple times throughout the project to permit configuration by either party after delivery and prior to installation.
4. Immediately inspect all OFE upon pick-up for damage and/or defects. Notify the Authority in writing of any damage or defects immediately upon discovery. The contractor shall assume full responsibility for any unreported damage and/or defects to OFE.
5. The Contractor shall provide all vehicles, hand trucks, carts and other means of transporting OFE within the project site. The Contractor shall transport OFE from the point of delivery to the point of installation.

D. Authority and Authority Vendor-Furnished Equipment and Services

1. Portions of this project may be furnished and installed by the Authority and/or Authority Vendors if noted. The contractor shall identify elements of the project provided by Authority and/or Authority Vendors that impact the contractor's scope of work and coordinate all work with such parties. Schedule work to permit authority vendors' access to required work areas with sufficient time to complete tasks in accordance with the Project Schedule. Refer to related specification sections for additional information.

1.4 REFERENCES

A. References to industry and trade association standards as well as all building codes are minimum installation requirements. The codes, standards and agencies listed below shall form a part of all related specification sections and all work shall comply with the latest adopted standards.

B. Authority Having Jurisdiction: The system shall comply with all applicable Codes, Ordinances and Standards as interpreted and enforced by the local authority having jurisdiction.

C. Local Adoption and Amendments: Follow the locally adopted version of all codes and standards. Where local jurisdictions or governments include amendments to codes including the National Electrical Codes, national health & safety codes, radio frequency regulations, or other building codes, the Contractor shall follow the locally amended versions and amendments.

D. Publication Dates: Comply with published standards in effect as of date of the Contract Documents unless otherwise indicated, including newer versions of the standards listed below.

1. Copies of Standards: Each entity engaged in construction on the Project should be familiar with industry standards applicable to its construction activity.
2. Copies of applicable standards are not bound with the Contract Documents.
3. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source.

E. Where the contract drawings and specifications mandate a greater requirement or performance than those specified by any of the below referenced codes and standards, the Contract Documents shall then be the governing requirements for this project. The minimum codes and standards to be applied for this project shall be the following;

1. National Fire Protection Association (NFPA):
   a. NFPA-70: National Electrical Code (NEC)
   b. NFPA-72: National Fire Alarm and Signaling Code
   c. NFPA-75: Standard for the Protection of Information Technology Equipment
   d. NFPA 76: Standard for the Fire Protection of Telecommunications Facilities
   e. NFPA-101: Life Safety Code
   f. NFPA 1221: Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems
   g. NFPA 780: Standard for the Installation of Lighting Protection Systems
2. American National Standards Institute (ANSI) / Telecommunications Industry Association (TIA):
   a. ANSI/TIA-455-61 FOTP-61: Measurement of Fiber or Cable Attenuation Using an OTDR
   b. ANSI/TIA-526-14-C: Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant
   c. ANSI/TIA-568-D.1: Commercial Building Telecommunication Standard
   d. ANSI/TIA-568-D.2: Balanced Twisted-Pair Telecommunication Cabling and Components Standard
   e. ANSI/TIA-569-D: Telecommunications Pathways and Spaces
   f. ANSI/TIA-606-B: Administration Standard for Telecommunications Infrastructure
   g. ANSI/TIA-607-C: Commercial Building Grounding and Bonding Requirements for Telecommunications

h. ANSI/TIA-758-B: Customer Owned Outside-Plant Telecommunications Infrastructure Standard
i. ANSI/TIA IS-811: Telephone Terminal Equipment, Performance and Interoperability for VoIP Feature Telephones.
j. ANSI/TIA-854: Full Duplex Ethernet Specification for 1000Mbps Operating Over Category 6 Balanced Twisted Pair Cabling
k. ANSI/TIA-1005-A: Telecommunications Infrastructure Standard for Industrial Premises
l. ANSI/TIA-1152: Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
m. ANSI/TIA-1183: Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems

3. Motorola
   a. R56 Standards and Guidelines for Communication Sites
4. Americans With Disabilities Act (ADA) 2014 ADAAG.
5. Underwriters Laboratories, Inc.:
   a. UL 486A: Wire connectors and soldering lugs for use with copper conductors
   b. UL 1449: Transient Voltage Surge Suppressors
   c. UL 1581: Standard for Electrical Wires, Cables, and Flexible Cords
   d. UL 1666: Standard for Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
   e. UL 478: Standard for Electronic Data-Processing Units and Systems
   f. UL 83: Thermoplastic-Insulated Wires and Cables
   g. UL 910: Test Method for Fire and Smoke Characteristics of Cables Used in Air-Handling Spaces." Provide products which are UL-listed and labeled.
   h. UL 969: Standard for Marketing and Labeling.
   i. UL Certified: UL's LAN Cable Certification Program
6. International Code Council
7. Institute of Electrical and Electronic Engineers (IEEE)
   a. IEEE 802.1, Bridging and Management
   b. IEEE 802.3, Standard for Ethernet (2012 with published amendments)
   c. IEEE 802.11 Wireless LANs
8. NEMA/ICEA Compliance:
   a. WC-5 - "Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy,"
   b. WC30 - "Color Coding of Wires and Cables," pertaining to control and signal transmission media.
9. Internet Networking Standards: Network hardware and software shall be able to communicate with the Internet and provide for the creation of IP based networks for the Authority. All supplied hardware shall comply with the following minimum standards and RFC’s as appropriate.
   a. RFC 950 - Internet Standard Sub-Netting Procedure
   b. RFC 1140 - Official Protocol Standards
   c. RFC 1156 - MIB Base for IP Networks
   d. RFC-1213 - MIB-II
   e. RFC-1757 - Remote Monitoring (RMON)
   f. RFC 1157 - Simple Network Management Protocol

g. RFC 1720 - TCP/IP, OSI Compliant
h. RFC 1918 - Address Allocation for Private Subnets
i. RFC 1583 - OSPF, Version II
j. RFC 1723 - RIP -II

10. ASTM Compliance: Comply with applicable requirements of D-2219 and D-2220. ASTM Compliance: Comply with applicable requirements of D-2219 and D-2220.
11. Building Industry Consulting Service International (BICSI)
    a. ANSI/BICSI-002, Data Center Design Standard and Recommended Practices
    b. Electronic Safety and Security Design Reference Manual (ESSDRM)
    c. Information Technology Systems Installation Manual (ITSIMM)
    d. Outside Plant Design Reference Manual (OSPDRM)
    e. Telecommunications Distribution Methods Manual (TDMM)
12. Safety Code for Elevators and Escalators – American Society of Mechanical Engineers (ASME 17.1).
13. Federal Communications Commission:
    a. FCC Regulations Part 15 Title 47.
    b. FCC: Federal Communication Commission Part 68 as modified by Wiring Docket 88-57.

F. Refer to the Responsibility Matrices in the Contract Drawings for additional information regarding the scope of work under this contract, and for information regarding items to be furnished by the Authority, which shall be designated as “Owner Furnished Equipment (OFE)”.

1. Where listed on the responsibility matrix, the following line items shall be defined as follows:
   a. Headend And Software: Includes any servers, management/administrative software, software licenses, and components which serve the purpose of performing system-wide coordination, monitoring, data processing, control and other global functions. Refer to related specification sections for additional information.
   b. Integration to Existing System: Includes all hardware, software, wiring, cabling, programming, protocol converters, interface devices and appurtenances as required to extend the physical or logical scope of an existing system, or to incorporate a new or disparate system into an existing system. Refer to related specification sections for additional information.
   c. Interfaces: Includes all hardware, software, wiring, cabling, programming, interface devices and appurtenances as required for communication between systems, or between a given system and an operator to provide the specified functionality. Refer to related specification sections for additional information.
   d. Network Switch: Includes layer 2 (access / distribution) or layer 3 (core / router) network switches.
   e. Backbone Cable: The segment of the premises distribution system that provides connection between telecommunications spaces.

f. Horizontal Cable: The segment of the premises distribution system that provides connectivity from communications rooms to field devices.
g. Field Devices: Components of a system which are served by the system headend and are the network endpoint or “edge” device. Refer to individual specification sections for additional information.

G. Additional System specific requirements may be included in the Sections referenced in 1.1. The Contractor shall meet the requirements in this Section in addition to those specific requirements for each System. Where common work results within this Section conflict with Sections listed in 1.1, the more stringent shall apply.

1.5 SYSTEMS DESCRIPTIONS

A. Refer to individual specification sections for systems descriptions.

1.6 SUBMITTALS

A. In addition to all submittal requirements as stipulated by Division 01 and any related specifications sections, the Contractor shall provide all submittals in accordance with the following:

1. The Authority approvals shall be obtained for all equipment and material before delivery to the job site. Delivery, storage, or installation of equipment or material which has not had prior approval will not be permitted at the job site.
2. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings, and other data necessary for the Authority to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
3. Prior to any submission the contractor shall be responsible for performing the following quality control items to ensure compliance with all project requirements:
   a. Review all Shop Drawings and Product Data
   b. Review all field measurement criteria.
   c. Review all field construction criteria and methodologies.
   d. Review all catalog numbers and similar data.
   e. Review all coordination requirements of affected trades.
   f. Review conformance to all appropriate specification sections.
4. Submit all system testing, commissioning and startup procedures to be employed. Include all estimated times for performance of all tests, all test equipment and manpower necessary for testing.
5. Submit all sub-contractor qualifications and certifications in accordance with the requirements as specified elsewhere in this specification section.

B. The Contractor shall schedule submittals to maintain the project schedule. For coordination requirements refer to Division 01 Specification Section, which outline basic submittal requirements and coordination. All Division 01 and related Specification Sections requirements shall be used in conjunction with all requirements as herein specified.

1. Submittals shall be provided as a complete submission; no partial submissions will be accepted. Failure to provide a complete submission shall result in all submittals being returned for resubmission.

2. No substituted equipment shall be reviewed without prior approval in accordance with the requirements of “substitutions” under Division 1 Specification Section.
3. Mark the submittals, "SUBMITTED UNDER SECTION__."
    a. Submittals shall be marked to show specification reference including the section and paragraph numbers.

C. All shop drawings shall be prepared using the latest version of AutoCAD or REVIT, drawn accurately, and in accordance with the Authority’s Standards and the requirements of Specification Section 01 33 23. Failure to provide a complete set of “Contractor prepared” installation drawings at the time of submittal shall result in all submittals being returned for resubmission.

1. Submission Packaging: The Contractor shall organize the submissions according to the following packaging requirements.
    a. Electronic Copy Submission: One complete set of electronic equipment data sheets and drawings submitted in PDF format and collated in two distinct files:
        1) Equipment Data Sheets, equipment schedules, alarm matrixes cable termination spread sheets, and all related pertinent information.
        2) Drawings including all site plans, floor plans, risers, point to point wiring, grounding, installation details, rack/cabinet and mounting elevations.
    b. Hard Copy Submission: Submit any required hardcopies of all shop drawings and product datasheets in accordance with the requirements the of Division 01 Specifications

D. Compliance Matrix

1. The Contractor shall submit a compliance matrix that summarizes compliance or non-compliance with each specification component.

E. Software

1. The Contractor shall provide software submittals including manufacturer’s/developer’s documentation for each type of software used in the project. Documentation shall include, at a minimum:
    a. Complete description of software features, proposed options and functionality.
    b. Software version and revision identification.
    c. Software manufacturer’s contact information for technical support, including address, telephone numbers, fax numbers and e-mail/web URLs
    d. Well-commented source code and an executable version for all custom and special purpose software. Source code shall be delivered in both hard copy and machine-readable formats on a media acceptable to the Authority. All compilers, case tools, utilities, etc. that are needed to create the executable code shall be included.

F. Re-submittals

1. Submitted items, found unsuitable, rejected or returned for revision by the Authority, shall be reworked by the Contractor and resubmitted.
2. Review of Contractor's submittals by the Engineer will be limited to examination of an initial submittal and one (1) resubmittal. The Authority reserves the right to obtain reimbursement from the Contractor for amounts paid to the Engineer for evaluation of any additional resubmittals due to incomplete information or non-compliance to the project documents on the part of the Contractor. An incomplete submittal (whether an initial submittal or a resubmittal) shall count as a submittal.

G. Shop Drawings

1. Provide all shop drawings shall include sufficient information, clearly presented, to determine full compliance with all project drawings and specifications. At the minimum include the following information as applicable for review. Failure to provide all information listed below shall result in all shop drawing submittals being returned for resubmission:
   a. All Building Floor and Site Plans.
   b. All equipment, devices and components with manufacturer's name(s), model numbers,
   c. All equipment, device and component electrical ratings and power requirements
   d. All equipment, devices, and component performance ratings.
   e. All equipment /device battery calculations,
   f. All equipment /device cable voltage drop calculations,
   g. All Speaker taps, voltages and zoning
   h. All equipment rack/cabinet layouts and rack/cabinet sizes.
   i. All device-mounting elevations.
   j. All device wiring details.
   k. All grounding and bonding connections.
   l. Complete point-to-point-wiring diagrams for all systems. Include all equipment and wiring termination schedules and/or matrices.
   m. Equipment, devices, cabling, and work related to Authority and Authority-Vendor furnished and/or installed work.

2. Provide a complete set of "contractor prepared" installation drawings. Drawings at the minimum shall consist of all floor plans indicating all passive and active electronic component locations, field devices, device identifications, distribution racks, patch panels, control panels, auxiliary control panels, power supplies, conduits, cable trays, and cabling distribution, as well as all 120-volt electrical circuit locations and designations.
   a. Drawings shall be made at 1/8" = 1'-0" scale. Drawings shall include at the minimum the following:
      1) Detailed equipment layouts for all communications rooms. Coordinate all room layouts with affected trades.
      2) Floor plan drawings showing locations of all equipment, devices, equipment cabinets and/or rack locations. Identify type and sizes of all equipment cabinets and/or racks.
      3) All equipment rack layouts showing locations of all rack mounted equipment items.

4) System riser diagrams and single line drawings, showing detailed connections for all parts of the system, including wire numbers, terminal block numbers and layouts, and other designations (point-to-point wiring diagrams). System performance measurements shall be documented as specified.
5) Equipment wattage for each location and rack/cabinet and estimated BTU production.
6) Detailed equipment layouts for all equipment consoles. Indicate all equipment locations, power connections, data connections and installation details.
7) All equipment mounting hardware/brackets and installation details, identify type size, load capacities of all mounting hardware/brackets; include all mounting and installation details, all space requirements, and any special architectural modifications required.
8) Outline drawings of all equipment cabinets/racks showing the relative position of all major components, all-wiring and grounding terminations. Include all panel, cabinet and/or rack dimensions.
9) Point-to-point wiring diagrams for all cabling. Include all cable drop identification at edge device and at termination equipment. Include complete wiring termination schedules.
10) All grounding and bonding termination points
11) All electrical circuit numbers and distribution panel locations.
12) Equipment, devices, cabling, and work related to Authority and Authority-Vendor furnished and/or installed work.

3. Provide a complete termination schedule of all communications device drop/outlet locations. Indicate on the installation drawings all device drops/outlet locations, termination room locations, unique identifications, cable types, cable distances and all pertinent data to properly evaluate the performance and capabilities of each cable run.
4. All drawings shall be prepared using an AutoCAD- or REVIT-based program; hand drawn mark-ups of the original Contract Drawings shall not be acceptable. Failure to provide a complete set of “contractor-prepared” shop drawings at the time of submittal shall result in all submittals being returned for resubmission.
5. All shop drawings shall include input from related trades for coordination. Related trades include, but are not limited to architectural, structural, mechanical, electrical, plumbing, fire protection, interiors, FFE, signage, wayfinding, and similar elements.
6. Contractor shall include Owner-Furnished Equipment in system block diagrams and MDF/IDF rack and cabinet elevations and details for coordination of power and overall space planning purposes.
7. The Contractor shall be responsible for reconciling rack and cabinet elevations submitted by various sub-contractors into a comprehensive rack and cabinet elevation drawing for each telecommunications space. Comprehensive rack/cabinet elevations shall include all rack/cabinet mounted equipment provided and/or installed by the Contractor or sub-contractors in a single drawing for each telecommunications space.

H. Equipment Submittals:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
   a. Include all equipment data sheets pertinent to equipment provided. All data sheets shall be highlighted and annotated indicating specific equipment and options supplied. Failure to provide the proper annotation of all equipment shall result in submittals being returned for resubmission.
2. Submit complete technical data necessary to evaluate the material and equipment. Include a complete technical specification for the submitted equipment, noting differences and adherence to this Section. Failure to provide the required data will result in all submittals being returned for resubmission.
3. Submit performance data, equipment ratings, cable requirements, control sequences, GUI based control panels, programming matrices, logic diagrams and all other descriptive data necessary to describe the installation and operations of the system being provided. Failure to provide the required data will result in all submittals being returned for resubmission.
4. Parts list, which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price, and availability of each part.
5. Installation Instructions: indicate application conditions and limitations of use stipulated by the applicable NRTL. Include instructions for storage, handling, protection, examination, preparation and installation.
6. Equipment, devices, cabling, and work related to Authority and Authority-Vendor furnished and/or installed work.

I. Maintenance and Operation Manuals: Submit in accordance with all requirements of Division 01 Specification Section and as herein specified.

1. Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of systems or equipment test and furnish the remaining manuals prior to contract completion.
2. Inscribe the following identification on the cover: the words "Maintenance and Operations Manual", include the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
4. Furnish (1) copy of all Maintenance and Operation Manuals in PDF format on DVD media or flash drive.
5. The manuals shall include:

a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
b. A control sequence describing start-up, operation, and shutdown.
c. Description of the function of each principal item of equipment.
d. Installation and maintenance instructions.
e. Safety precautions.
f. Diagrams and illustrations.
g. Testing methods.
h. Performance data.
i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
j. Contractor contact information.
k. Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

6. Approvals will be based on complete submission of manuals together with shop drawings.

1.7 QUALITY ASSURANCE

A. Quality Assurance services as described below shall be provided by the Contractor. The Authority will only provide Quality Assurance inspection.

1. Quality Assurance services described in this section are a portion of the quality assurance activities which may be necessary to achieve full compliance with the Contract Documents and are not intended to limit the activities of the contractor.
2. These provisions do not relieve the contractor of providing quality control services or other inspections to the Authority or authorities having jurisdiction over this project.
3. A quality assurance supervisor whose responsibility it is to ensure compliance with the contract documents shall be included in the quality assurance program. This person shall be assisted by other quality assistance staff as warranted by the specific construction activities and workload.
4. The Contractor shall submit signed Quality Assurance Summary reports to the Authority. These reports shall address both project progress and project quality control activity.

B. Quality Assurance Program

1. The Contractor shall establish a Quality Assurance Program to perform inspection and tests of all items of work. This Program shall insure conformance to applicable specifications and drawings with respect to the materials, codes, workmanship, construction, finish, functional performance, and identification. This Program shall be established for all system rollout and phasing plan work performed under this Contract. The Contractor’s Quality Assurance Program shall specifically include surveillance and tests required in the technical provisions of the specifications.
2. The Contractor shall describe its Quality Assurance Program in detail. Descriptions shall be given for at least the following:
   a. Organization

b. Inspection
c. Testing
d. Documentation
e. Administration
f. Quality Awareness and Training
g. Forms
h. Schedules
i. Submittals

3. Before the Contractor's Quality Assurance Program description is submitted, the Contractor shall meet with the Authority and discuss the Contractor's Quality Control Plan. The meeting shall develop a mutual understanding of the details of the plan, including the forms to be used for recording the quality assurance operations, inspections, administration of the plan for both on-site and off-site work, and the interrelationship of the Contractor and the Authority inspection. The Contractor shall prepare meeting minutes which shall be incorporated in the Contractor's Quality Assurance plan.

C. Contractor Qualifications: Each contractor or sub-contractor shall be an accredited and authorized distributor of the appropriate equipment manufacturer and shall be fully certified in the installation, testing and programming of all equipment being provided. These qualifications shall be submitted and approved by the Authority and for all persons performing work on the system.

1. The Contractor shall submit documented successful work experience of at least three (3) facilities of equivalent size and technical requirements utilizing the proposed equipment being provided.
   a. Experience shall be defined as the completion of the specific system being provided, with that system being successfully operated for its intended purpose for at least three (3) years.
   b. In addition to the above "Experience" shall also be defined as the completion of modifications and renovations to any associated system being provided in any existing occupied facility of this size and magnitude.
   c. For each facility submit the following:
      1) Name and location of facility
      2) Date of Occupancy or beneficial use by Owner
      3) Owner's representative to contact and telephone number
      4) Construction Manager or General Contractor
      5) Project Architect or Engineer
      6) Provide information on the installed locations with operational equipment
2. Submit a technical resume of experience for the Contractor's Project Manager and on-site installation foreman who will be assigned to this project.

D. Service Qualifications: All sub-contractors shall be a permanent service organization maintained and/or trained by the product manufacturer on the products being provided for this project.

1. The sub-contractors shall be (where required) properly licensed by the governing municipality to provide the services and work for the specific system being installed. In addition, all sub-contractors shall be capable of providing full service for the entire warranty period within a 4-hour response time 24 hours per day, 7 days per week upon notification of a service emergency.

E. Manufacturer's Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and materials specified for this project and shall have manufactured the items for at least five (5) years.

F. Non-Compliance

1. The Authority may notify the Contractor of any non-compliance with the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered to the Contractor or its representative at the site of the work, shall be considered sufficient notice.
2. If the Contractor fails or refuses to comply promptly, the Authority may issue an order stopping all or part of the work until satisfactory corrective action has been taken. It is understood and agreed to the following:
   a. Time lost due to any such stop order is the responsibility of the Contractor.
   b. Costs to repair, replace or otherwise remedy the defective work are the responsibility of the Contractor.
   c. Costs incurred by the Authority to correct defective work shall be deducted from the total amount due the Contractor. An amount may be withheld from the payment due the Contractor to recoup expenses incurred by the Authority due to non-compliance.
3. Failure of the Authority to notify the Contractor of non-compliance does not relieve the Contractor of the responsibility to comply fully with the requirements of the Contract Documents and does not preclude the Authority from taking the corrective action specified in this paragraph.
4. In cases where implementation of the Quality Assurance Program does not comply with either the Contractor's Quality Assurance Plan or the Contract Provisions, or where the Contractor fails to properly operate and maintain an effective Quality Assurance Program, the Authority may:
   a. Order the Contractor to replace ineffective or unqualified quality control personnel.
   b. Assign the Authority or contracted outside professional staff to carry out the functions and operations of the Contractor's approved Quality Assurance Plan. Costs incurred by the Authority to operate a Quality Assurance Program or to otherwise remedy the Contractor's non-compliance with quality-related provisions of the contract shall be deducted from the total amount due the Contractor.

1.8 DELIVERY, STORAGE AND HANDLING

A. In addition to the requirements below, refer to specific related specification sections for additional requirements.

1. Contractor shall store all equipment and materials in a climate controlled environment. Storage environment shall, at a minimum, comply with the following:
   a. Temperature not to exceed: -20˚ C to +70˚ C (-4˚ F to + 158˚ F)
   b. Relative humidity of 5% to 95%, non-condensing.
2. Where manufacturer's storage requirements are more restrictive than those listed above, store such equipment and/or materials in compliance with all manufacturer's requirements.
3. Do not store equipment or materials in areas where fire or explosion hazards exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers. Do not store equipment or materials in areas subject to corrosive agents, liquids or gasses.
4. Do not store equipment or materials in areas that contain potential water hazards (including, but not limited to, restrooms, kitchens, or mechanical spaces), or adjacent to liquid-carrying pipes.

B. The Contractor shall store materials only in areas designated by the Authority.

C. The Contractor, for all equipment to be removed, shall coordinate with the Authority the location for the Contractor to place all equipment noted to be turned over the Airport after replacement of the systems.

D. The Contractor shall coordinate and participate in product delivery and movement to installation locations with the Authority within both on- and off-hour periods as required to minimize impact to the Airport operations.

E. The Contractor shall be responsible for product shipment, delivery and storage/staging/testing location onsite. The Contractor shall coordinate with the Authority regarding site readiness and refer to architectural drawings regarding placement.

F. The Contractor shall provide a security plan for approval by the Authority describing the methods, areas, and access for equipment. The plan shall include how equipment will be securely stored and accessed by the Contractor, and Authority within communications rooms, MDFs, IDFs, control rooms, and similar spaces throughout construction.

1.9 RECORD DOCUMENTS (AS-BUILT DOCUMENTS)

A. In addition to all general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections include the following project requirements;

B. Project Record Documents

1. Provide record documentation to the Authority at the completion of each phased installation and at Contract Closeout. To ensure that this submittal reflects proper record keeping during the Work, maintain on-site one (1) set of the Contract Drawings, specifications, addenda, change orders and other modifications to the Contract, and reviewed shop drawings and product data.
2. Legibly mark and record at each specification section a description of actual products installed, including the manufacturer's name and product model number, product substitutions or alternates approved and utilized, and changes made by Addenda and Modifications.

3. Legibly mark Record Documents and shop drawings to record actual installation including communication conduit, cabling and pathways used, field changes of dimensions and detail, changes in details from those indicated on drawings, details not on original Contract Drawings, and provide make and model of actual product installed.
4. Mark whichever drawing is most appropriate to showing “field” conditions fully and accurately. If necessary, provide scaled drawings of modifications and give attention to concealed work, which would be difficult to measure and record later. Note related change order numbers where applicable. Organize record drawing sheets into manageable sets, and print suitable titles, dates, name of installing company, name and signature of job superintendent, and other identification on the cover of each set.

C. As-Built Documentation

1. Provide complete set of finalized copies of record documents prior to final acceptance of the project by the Authority in accordance with all requirements of Division 01 specification sections. At the minimum the as-built documents shall contain all information, data, and drawings as described in the “Submittals” paragraph of this specification section as well as all shop drawing requirements of related specification sections.
    a. As-built documents shall be submitted in both paper and electronic media formats in the quantities as specified by Division 01 specification requirements.
        1) All electronic record drawings shall be prepared and submitted utilizing an AutoCAD- or REVIT-based program as manufactured by Autodesk. Where electronic documents are prepared using other than an AutoCAD or REVIT program manufactured by Autodesk, the contractor shall provide to The Authority the necessary software to electronically view the submitted documents.
        2) All electronic data sheets, control sequences, programming matrices and other descriptive data shall be provided in PDF formatted documents.
        3) Copies of all current system programming and associated software shall be provided on downloadable media formatted for the use in restoration all system operations and functionality in the event of a catastrophic failure.
2. As-Built documentation shall include finalized equipment locations, cable and conduit routing pathways, and installation details. The As-Built documentation shall not be redlined copies, but be finalized AutoCAD or REVIT drawings. The As-Built documentation shall build on the initial design details and further develop these based on specific installation details.
3. As-Built documentation shall be capable of being inserted into the Authority GIS system.
4. The level of detail defined in these As-Built documents shall be suitable to allow any third party to support system maintenance as well as support future integration and expansion of installed systems at the Airport.

5. All junction boxes containing any system splices shall be uniquely identified in the field and indicated on the as-built drawings with corresponding schedule identifying all related splices at the specific junction box locations.

1.10 OPERATION AND MAINTENANCE

A. Refer to specific related specification sections for requirements in addition to the following.

B. Provide complete set of operating and maintenance manuals in accordance with all requirements of Division 1 and related Division 27 specification sections. The manuals shall include all operational programming and maintenance information for the system being provided. Edit all manuals specific to the installation of the provided system; manufacturer's documentation alone shall not be acceptable. Include all, manufacturer's technical data sheets, programming matrixes and graphic screen representations.

C. Operations Manuals

1. Provide a clear and concise sequence of operation that gives, in detail, the information required to properly operate all equipment and systems. Include detailed programming matrixes, indicating at the minimum all manual and automatic functions for all system, components and devices comprising the system being provided.

D. Maintenance Manuals

1. Include maintenance instructions and other descriptive material as received from the manufacturer to enable designated personnel to maintain and test equipment.
2. Include descriptions, specifications, layout drawings (showing component types and positions), and back-panel and assembly wiring diagrams.
3. Provide instructions for preventative maintenance procedures that include examinations, tests, adjustments and periodic cleaning.
4. Provide guidelines for isolating the causes of hardware malfunctions and for localizing faults.

1.11 SOFTWARE AGREEMENT

A. The Authority shall retain the ownership and access rights of the source code for all custom system programs and software specifically developed and/or modified as part of this project. Additionally, the Authority shall retain ownership of all software licenses for "off the shelf" software furnished and installed as part of this project.

1. The Contractor shall provide to the Authority complete copies of all current software programming and software licenses related to the operation of each system prior to final acceptance of the related Contract scopes of work.
   a. All programming shall include but not be limited to all device identifications, device descriptions, Programming Logic Matrices, all program access level passwords as well as all function and sub-function routines.

2. Programming and software copies shall be provided to the Authority on DVD digital formatted media or flash drive. In addition, the contractor shall provide a complete hard copy printout of all system programming and shall be included as part of closeout documentation for review by the Authority.

B. Software and firmware upgrade provisions shall be included as part of this specification requirement and shall include the automatic upgrades as required to maintain all software and firmware to the manufacturers most current revision on all system components installed and or modified as part of this project for duration of the warranty period. This upgrade policy shall require the contractor to install, test, and certify all software and firmware upgrades that become available from manufacturer for a period of one year from date of final acceptance to the expiration of the warranty.

1. Upgrading of software shall include all revised/new software, labor, testing certification as well as all licenses, software and all programming copies as described in the Record Documents paragraph of this section associated with the installation of all revised software.
2. These updates shall be accomplished in a timely manner, fully coordinated with the system operators, and incorporated into the operations/maintenance and software documentation manuals.
   a. One (1) scheduled final update shall be provided near the end of the warranty period, at which time the Contractor shall install and validate the latest released version of the Manufacturer's software and firmware for all systems installed and/or modified for this project.
   b. All software changes shall be recorded in a log maintained in the unit control. An electronic copy of the most current software update shall be maintained within the log.
      1) At a minimum, the contractor shall provide a description of the modification, when the modification occurred, and name and contact information of the individual performing the modification. The log shall be maintained in a white 3 ring binder and the cover marked "Software Change Log."
3. Provide not less than thirty days' notice to the Authority to allow scheduling and access to system and to allow the Authority to upgrade computer equipment if necessary.

1.12 SPARE MATERIAL

A. In addition to all general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections refer to related Specification Sections "Extra Material" for specific requirements.

B. All spare materials shall be provided at the time of final acceptance of the project and a signed packing list shall be obtained at the time of delivery. At no time is the contractor to use the spare materials provided for this project to replace malfunctioning or damaged equipment and or components.

1.13 ENVIRONMENTAL CONDITIONS

A. Systems, components, devices materials, and equipment shall be capable of withstanding the environmental conditions of the space without mechanical or electrical damage or degradation of operating capabilities or performance.

B. All devices, components, or equipment installed on the exterior of the facility shall be provided in accordance with all manufacturers' requirements to ensure the proper operation when exposed to the environmental conditions and/or average annual highest and lowest temperature that can be anticipated for the geographic region of the facility, as well as anticipated temperatures within a sealed enclosure exposed to direct sunlight.

1. Interior, Controlled Environment: System components, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of 2 to 50 °C (36 to 122 °F) dry bulb and 20 to 90 percent relative humidity, non-condensing and shall utilize NEMA 250, Type 1 enclosures.
2. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of -18 to 50 °C (0 to 122 °F) dry bulb and 20 to 90 percent relative humidity, non-condensing and shall be installed in NEMA 250, Type 4X enclosures.
3. Exterior Environment: System components, conduits and back-boxes installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of -34 to 50 °C (-30 to 122 °F) dry bulb and 20 to 90 percent relative humidity, condensing. Rated for continuous operation where exposed to rain as specified in NEMA 250, winds up to 240 km/h (149 mph) shall utilize NEMA 250, Type 4X enclosures.
4. Hazardous Environment: System components, conduits and back- boxes located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components, conduits, and back- boxes subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, shall utilize NEMA 250, Type 4X enclosures.
6. Submersible Environment: System components, conduits and back-boxes subjected to prolonged submersion in water, shall utilize NEMA 250, Type 6P enclosures.
7. Areas where equipment and devices may be subject to damage by the general population shall be installed in vandal resistant enclosures; all fire alarm system and related devices shall be provided with wire guards.
8. Console: All console equipment shall, unless noted otherwise, be rated for continuous operation under ambient environmental conditions of 15.6 to 29.4 °C (60 to 85 °F) and a relative humidity of 20 to 80 percent.

PART 2 - PRODUCTS

2.1 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, that meet and/or exceed the specified performance and features of the equipment and/or systems and for which replacement parts shall be readily available to the contractor and/or using agency. The equipment specified is based on the acceptable manufacturers listed. Where "or equal" is stated, equipment shall be equivalent in every way to that of the equipment specified, and subject to approval.

1. When more than one unit, device, or component of the same class of equipment is required, such units, devices, or components shall be the product of a single manufacturer.
2. Acceptable manufacturers for each system shall be as specified and shall be provided in full compliance with the requirements of this and all related specification sections and contract drawings.
    a. Manufacturers listed as acceptable shall not negate the contractors' responsibility for providing all equipment, devices, components, and/or systems, in accordance with all functions and performance requirements of the Contract Documents.
    b. Where manufacturer and/or manufacturer model numbers reference specific system components in the related specification sections, it is to establish the performance requirements and quality of the systems and components only.
        1) It is in no way an inference that the referenced model numbers are the manufacturer's current product and are the only acceptable components for this project unless specifically referenced as "no substitutions."
    c. Equivalent UL- listed equipment may be substituted for the approved manufacturers unless stipulated by other Specification Sections as "No Substitutions." All substitutions shall be submitted for approval by the Authority in accordance with all requirements of Division 01 Specification Sections and "Submittals" chapter of this Specification Section.
        1) Where systems and/or components are referenced as "no substitutions" the specific system and/or components shall be provided.
        2) All substitutions shall comply with all requirements as specified above and all system performance standards shall be maintained.
        3) The contractor shall stipulate the following information impacted by such a substitution.
            a) Any and all extensions in time impacted by the substitution.
            b) Any changes to the architectural or structural elements to the project
            c) Differences in operation and/or performance from intended system criteria. Note all deviations from the requirements of the Contract Documents on the Compliance Matrix. Provide sufficient detail to enable thorough review of how the proposed equipment or solution differs from the requirements of the Contract Documents.
        4) Failure to provide the required substitution information shall result in "without consideration" the immediate rejection of the substituted equipment and/or systems.
3. Due to the rapid advancement and antiquation of hardware technology, the supplied hardware shall be the "contemporary technical and operational equivalent" of the specified hardware. The following requirements shall be met:

a. Contemporary technical and operational equivalent shall be based on a comparison of technology at the time of publication to the technology at the time of ordering the equipment.
b. Hardware shall be ordered as close to the actual installation date for a given phase as reasonable (i.e., latest responsible date). Final hardware approval and scheduled order date are at the sole discretion of the Authority.
c. Hardware equivalence shall be based on both technical equivalence and operational equivalence.
d. Contemporary technical equivalence shall be based on device performance and class specifications.
e. Contemporary operational equivalence shall be based on industry standards, maintainability and functions.

4. The Manufacturer's product or product line/series shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years. The Authority reserves the right to require the Contractor to submit a list of installations where the products have been in operation for the specified period of time prior to approval of shop drawings.
   a. The manufacturers shall submit the appropriate documentation certifying that the installing sub-contractor is a qualified service provider of all manufacturers' products being provided for this project.
   b. The Manufacturer shall certify that the submitted product will continue to be fully supported for a minimum of (5) years after acceptance by the Authority.

B. Equipment Assemblies and Components:

1. Components of an assembled unit need not be products of the same manufacturer.
   a. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
   b. Components shall be compatible with each other and with the total assembly for the intended service.
   c. Constituent parts which are similar shall be the product of a single manufacturer.
   d. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.

C. Electrical Components, Devices and Accessories

1. Shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Compatibility and Interoperability of System Components and Devices

1. Where multiple components, devices, and/or systems are intended to be interconnected and components of a complete system in accordance with any related specification sections, it shall be the Contractor's responsibility to verify interoperability and compatibility of said components, devices, and/or systems in full conformance to the specified performance criteria prior to the submission of shop drawings.
2. Where specified devices are found to be incompatible or incapable of performing as specified in a seamless manner, the contractor shall notify the Authority in writing prior to submission of shop drawings. Failure to properly identify such functional discrepancies shall not relieve the contractor from providing a complete and fully functional system in accordance with the requirements of all related specification sections.

E. Where Factory or Off-Premises Testing of any equipment, product or assembly is recommended by the product manufacturer or where specified as part of this section and/or any related specification section:

1. The Authority, shall have the option of witnessing all factory tests. The Contractor shall notify the Authority at a minimum of thirty (30) working days prior to the performance of any factory or off-premises tests.
   a. Where the factory or assembly point for all off-premises testing is not within two (2) hours driving time from the project location, the contractor shall include as part of this project all per diem costs (travel, meals and lodging) for two representatives from the Authority to witness all testing. Any travel overseas shall include business-class airfare. Lodging shall consist of 3-star or better accommodations.
2. Provide four (4) copies of certified test reports containing all preliminary test data and testing procedures shall be furnished to the Authority prior to any final testing and not more than ninety (90) days after completion of any tests.
3. When equipment, product, or assembly fails to meet any factory or off-premises tests, retesting of equipment, product, or assembly shall be mandated, the manufacturer/contractor shall be liable for all additional expenses, including all expenses incurred by the Authority for witnessing the retesting of any equipment, product, or assembly.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate with all trades at the time of shop drawing submission detailing all space and/or room conditions. The contractor shall coordinate with the appropriate trade all conditions impacting the installation of any system including but not limited to all equipment locations, ceilings, lighting fixtures, fire protection piping, and ductwork layouts to the satisfaction of all concerned trades, subject to final review by the Authority.

1. Coordinate exact location of all desktop/counter mounted equipment with the Authority, as well as all affected trades and tenants prior to the installation of any equipment and/or cabling.
2. Coordinate exact location(s) of all ceiling mounted cable, conduits, cable tray, equipment, and/or devices with all architectural plans, reflected ceiling plans and affected trades prior to installation.

3. For equipment installations requiring coordination with other trades, the contractor shall provide all supplemental framing, bracing, templates, backboxes and equipment anchor bolts for mounting or flush mounting preparation, (e.g. pedestals or other devices requiring mounting on walls, concrete pads or other materials). Coordinate delivery of templates and equipment anchor bolts to preclude any delay in the construction schedule or the work of the affected trade.
4. If installation of equipment, raceways, cable trays, J-hooks and/or conduit is performed prior to coordination with other trades, which interferes with work of other trades or operation and maintenance of the facility, make necessary changes to correct the condition at no additional cost to the Authority.
5. Contractor to provide all component MAC addresses to the Authority in device labeled floor plans and spreadsheet form for network configuration.

B. Prior to final programming of all systems review with the Authority all system features, functions, system operations and related operational programming for all systems provided.

C. Provide coordination with all system sub-contractors and trades for the proper installation of all equipment, components, and all integration requirements in order to provide fully operational systems in accordance with all applicable specification sections.

D. Each Contractor shall maintain a complete set of current and up to date shop drawings and equipment submissions at the job site at all times. Shop drawings and all other submissions shall be made available to the Authority upon request.

E. Coordinate the work of this contract with the work of the Authority and all Authority Vendors. Schedule all work to ensure that the work of the Authority and all Authority Vendors can proceed in accordance with the Project Schedule.

3.2 EQUIPMENT PROTECTION

A. Protect all materials, equipment, devices, or components permanently installed and/or stored on the job site. Protect all materials, equipment, cabling, devices, or components during construction and after installation. Provide appropriate protection of all materials, equipment, components, and/or devices until time of substantial completion. All materials, equipment, components and/or devices shall be protected during shipment and storage against any physical damage, dirt, moisture, extreme temperatures, precipitation, theft and/or vandalism:

1. During installation, enclosures, racks/cabinets, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of any foreign matter; and shall be vacuum cleaned both inside and outside before testing and operating and repainting if required.
2. Any materials, equipment, components and/or devices, stored on site, which have been deemed by the Authority to exhibit any indications of damage or exposure dust or moisture shall not be installed and shall returned to the source of supply for immediate replacement.

a. The use of spare parts or the return of defective equipment for repair to mitigate the damage of defective materials, equipment, components, and/or devices shall not be acceptable. All materials, equipment, components, and/or devices shall be new and unused until final acceptance by the Authority.

3. Provide and apply protective material immediately upon receiving the products and maintain throughout the construction process.
   a. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
   b. Any damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired area is not obvious or detectable.
4. Failure to properly protect all materials, equipment, components and/or devices prior to final acceptance shall constitute sufficient cause for rejection of materials, equipment, components and/or devices should any defects, damage or degradation in performance is observed.

B. Seismic Performance: The Contractor shall furnish and install all equipment bracing, and anchoring rated for the seismic zone of the geographical area in which the project resides, and shall withstand the effects of earthquake motion and wind forces in accordance with the current editions of the IBC and ASCE/SEI 7. Refer to Refer to Division 01 and Division 26 – Hangers and Supports for additional seismic information and requirements.

1. Equipment shall include, but not be limited to, racks/cabinets, video monitors, TV's, cable trays, conduits, junction boxes, and all associated appurtenances.

C. Immediately replace all malfunctioning materials, equipment, components, and/or devices with new unused products up until the time the Authority issues final acceptance of the system. The returning of any malfunctioning equipment, devices, and/or components to the manufacturer for repair and then reinstallation at the project site shall not be acceptable.

1. All replacement materials, equipment, components, and/or devices shall be factory new and not obtained from the Project's spare parts inventory or use factory recycled products unless expressly identified by contractor prior to replacement and approved beforehand by the Authority.

3.3 WORK PERFORMANCE

A. Receipt, storage, transport, handling, installation, final termination, testing, start-up and commissioning of all systems, system components and cabling infrastructures shall be under the direct supervision of the appropriate system sub-contractor. The sub-contractor shall be an accredited and authorized distributor of the appropriate equipment manufacturer and shall be fully certified in the installation, testing, commissioning, and programming of all equipment, devices, components, and/or systems being provided as part of this project.

B. Job site safety and worker safety is the responsibility of the Contractor. Ensure that safe access and egress from all work areas is maintained during movement and installation of materials. Clean up all debris generated by installation activities. Keep all communications equipment rooms free of debris at all times. Communications rooms are not to be used for the storage of tools or project materials at any time during the project.

C. Pre-installation Conferences: Include provisions to attend all Preconstruction/Preinstallation conferences at Project site in compliance with all requirements in Division 01 Specification Section and as herein specified. Review methods and procedures related to installation and operations of all communications systems, including, but not limited to, the following:

1. Inspect and discuss electrical and equipment roughing-in related to all communications systems as well as other preparatory work required to be performed by other trades.
2. Review and discuss all work, equipment deliveries, installation procedures, and related scopes as required to conform to the phased construction schedule.
3. Review sequence of operations for each type of system, control, cabling and/or integration to any systems and/or equipment provided by other trades.
4. Review and finalize construction schedule and verify availability of materials, installation personnel, equipment, and any preparatory work by other trades needed to make progress and avoid delays.
5. Review required start-up, testing, commissioning, and certifying procedures to be employed for each system and any impacts to other trades.

D. For work on existing facilities, arrange, phase, and perform work to assure the operation of all communications systems for other buildings and contiguous spaces at all times. Refer to Division 01 Specification Section for additional requirements.

E. All new work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Division 01 Specification Section.

F. Remove all unnecessary tools and equipment, unused materials, packing materials, and debris from each area where work has been completed unless designated for storage.

G. Coordinate the installation of all cabling, conduits/raceways and cable trays and equipment with applicable trades to ensure proper operation and function of all integrated systems in accordance with all related specification sections. Refer to Division 01 Specification Section for additional project coordination requirements.

a. Prior to the final programming of any systems review with The Authority all system features, functions, system operations, network mapping, system integrated responses and all related programming as required for the proper operation of the respective communications systems.

H. The Contractor shall prepare the necessary documents required for installing, testing, and bringing each system online. Such documents include but are not limited to:

1. Project management and quality assurance plans

2. Testing plans
3. Component and system submittal documents
4. Installation plans
5. Component design plans
6. System user documentation
7. As-built drawings and documentation
8. Authority-required documentation including, but not limited to Cable Management Reports and Device Schedules.

I. The Contractor shall coordinate with the Authority to ensure each system meets the project requirements. The Contractor shall meet all ADA requirements.

3.4 EQUIPMENT INSTALLATION

A. General

1. The Contractor shall provide all tools and test equipment required to install, verify, and test the installation and to determine that it meets the specifications. The Contractor shall furnish all necessary materials required to implement and to achieve the required work performance.
2. The Contractor shall install products detailed in the specifications, system requirements, drawings and Contractor designs including those purchased by the Contractor and those provided by other parties.
3. All equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Specification shall be subject to the control and approval of the Authority.
4. All system equipment installations shall be in accordance with good engineering practices, NEC, local building codes, industry standards and all manufacturer’s requirements. Cable terminations at all equipment locations shall comply with all state and local electrical codes and industry standards. All wiring shall test free from all grounds, shorts, stray voltages, and EMI.
5. Follow manufacturers' instructions for installing, components and adjusting all equipment and cabling. Submit two (2) copies of such instructions to the Authority a minimum of fourteen (14) days before installing any equipment related to the submitted instructions. Provide an additional copy of such instructions at the equipment during any work on the equipment. Where no instructions are included with the equipment, follow accepted industry practices and workmanlike installation standards.
6. Equipment location shall be as close as practical to locations as indicated on the contract drawings.
    a. Provide all equipment clearances in accordance with NEC requirements and industry standards. Arrange equipment to facilitate unrestricted access for maintenance and service around all equipment, components, and/or cable terminations.
7. Where the Authority determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the project.

a. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

8. System/Hardware and mounting must comply with IBC Seismic Requirements.
9. Comply with manufacturer's published rated load for all fasteners, brackets, enclosures, racks, cabinets, cable trays and supports for system components.
10. For equipment mounted in drawers or on slides, provide the interconnecting cables with a service loop of not less than three feet and ensure that the cable is long enough to allow full extension of drawer or slide.
11. The Contractor's quality assurance Inspector shall conduct a visual inspection of all installations to verify that the installations are in accordance with the project's and manufacturer's specifications. Records of the inspections signed and dated by the Quality Assurance Inspector shall be provided to the Authority. Prior to any scheduled inspections the Authority representative shall be notified by the Contractor of any inspection(s) so they may witness.

B. Software Installation

1. The Contractor shall test all custom and packaged "off-the-shelf" software in development, test, stage and production environments, and have successfully passed factory acceptance testing, prior to installation on-site.
2. Contractor shall install and configure all software in accordance with the software manufacturer's installation instructions. Apply the latest patches and security updates, unless otherwise noted.

C. Hardware Installation

1. Final hardware selected and installation of hardware shall be coordinated with the Technical Project Manager. Additionally, the Contractor shall ensure the ventilation requirements for all hardware components are met.
2. The Contractor shall install and inspect all hardware required in this specification in accordance with the manufacturer's installation instructions. Final placement of hardware is subject to the Authority approval.
3. The Contractor shall be responsible for any and all loss or damage in the shipment and delivery of all material until transfer of title to the Authority.
4. The Contractor shall obtain written permission from the Authority before proceeding with any work which requires cutting into or through any part of the building structures such as, but not limited to, girders, beams, concrete, carpeted or tiled floors, partitions or ceilings. The Contractor shall obtain written permission from the Authority before cutting into or through any part of the building structures where fireproofing or moisture proofing could be impaired. In any such case the Contractor shall be responsible for restoring the affected area to "like-new" condition or to a condition to match the existing conditions.
5. The Contractor shall take all steps necessary to ensure that all public areas remain clear or are properly marked during installation or maintenance.
6. The Contractor shall coordinate installation with the Authority, to minimize disruption of existing business functions at the airport.

7. The Contractor shall place materials only in those locations that have been previously approved. Any other locations shall be approved, in writing, by the Authority.
8. The Contractor shall label all cabling and patch cords in accordance with the Authority approved labeling plan. Coordination with the Authority shall be performed, and all labeling shall be approved, prior to implementation.

D. System Startup

1. Subject to the responsibility matrix on the Contract Drawings, the Contractor shall not apply power to the system until after:
   a. System and components have been installed and inspected in accordance with the manufacturer's installation instructions.
   b. A visual inspection of the system components has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
   c. System wiring has been tested and verified as correctly connected as indicated.
   d. All system grounding and transient protection systems have been verified as properly installed and connected, as indicated.
   e. Power supplies to be connected to the system and equipment have been verified as the correct voltage, phasing, and frequency as indicated.
   f. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installations, defective equipment items, or collateral damage due to Contractor work/equipment.

3.5 COMMUNICATIONS CABLING REQUIREMENTS

A. All wiring and cables shall be properly dressed and/or bundled with hook-and-loop (Velcro) straps or cable ties. Twisted wire, tape, rope, twine, phone wire and similar bits of debris usually available on site are not acceptable substitutes for proper securing hardware. All inter-rack cables and wiring must be properly routed, and where available, in cable trays. Overhead cables must be easily removed or reworked within the cable trays. Proper care must be taken to ensure that new cables added to the trays are not stressed or intertwined with existing cables. Cables shall not be broken out of their outer jackets except within enclosures designed to support and protect cable break-outs. Overhead cables may not cross perpendiculars or be suspended in mid-air without supports.

1. Cables exiting conduits at a height exceeding 18” above cable tray shall be supported by conduit waterfall fittings. Cables shall not exit conduits at a height exceeding 3 feet above the supporting cable tray.

B. Cabling shall be sized to support the appropriate communication system. All communications cable installations shall be in accordance with good engineering practices as established by the ANSI/TIA, IEEE and the NEC and all referenced standards. All cabling shall meet all state and local electrical codes. All cabling shall test free from all grounds, shorts, and EMI.

1. Contractors shall have the option to combine all cable home runs and conductors of same type and voltage “class” in accordance with NEC requirements unless specified elsewhere. Size all conduits and cable trays to meet the required fill ratios and install all conductors in accordance with NEC requirements, referenced standards and manufacturers recommendations.
    a. All communications cabling located above accessible suspended ceilings shall be installed in conduit or cable trays.
    b. Cabling installed above hard ceiling spaces shall be installed in dedicated conduits.
    c. No exposed cabling will be acceptable in finished or occupied spaces of the facility without approval by the Authority.
    d. Any communications system cabling installed exterior to the building and/or all cabling being routed from the facility to any remote location external to the project location shall utilize OSP rated fiber optic cable installed in conduit system. Wherever a cable being routed from outside exceeds 50 feet inside the building, the Contractor shall install an indoor/outdoor rated cable suitable for use in duct and rated for the application within the building, e.g. riser, plenum.
2. Do not install bruised, kinked, scored, deformed, abraded, or otherwise damaged cable. Do not splice cable between indicated terminations, taps, or junction points. Remove and discard cable where damaged during installation and replace it with new cable.
3. Ensure that all communications cabling supports (conduits, support grips, cable trays, and cable termination panels) are fully installed before proceeding with cable installation.
4. At no time shall any cables be installed and left unsupported, nor shall cables be tie-wrapped to any other supporting structure in lieu of specified cable supports. Do not tie-wrap or permanently affix cable bundles to approved cable supports.
    a. NOTE: Cable bundles shall not be cinched too tightly; all cable ties shall be hook-and-loop (“Velcro”) strips only.
5. The Contractor shall not permit any communications cabling to lie unprotected on the floor at any time. If cables must be left on any floor, protect the cables so that they may not be walked on or have any material or equipment placed or rolled on top. Replace all damaged cables from demarcation to termination point; no splicing of damaged cables shall be permitted.
6. Maintain manufacturers recommended minimum bend radiuses of all cabling. Where referenced standards stipulate a larger bend radius than that specified by the manufacturer, comply with the larger requirement. Do not stretch, stress, tightly coil, bend, or crimp cables. The Contractor shall keep all cabling out of the way of other trades during staging of any work. The contractor at the contractor’s expense will replace all severely stressed or damaged cables, equipment, and materials as determined by the Authority.
7. Do not exceed the manufacturer’s maximum specified pull tension during installation. Where the manufacturer does not specify a maximum pull tension, follow those specified in the applicable referenced standard(s). Contractor shall utilize a winch with tension control or a "break- away" link designed to break away at or below the recommended maximum pulling tension.

8. Special care shall be taken to avoid damage to the cable. While under pulling tension, the cable shall not be bent into a curve with a radius of less than twenty (20) times the cable diameter, or no less than manufacturers minimum.
9. Use methods and lubricating compounds on cables and wires to prevent damage to material and products during roughing-in. Provide compounds that are not injurious to the cable and wire jackets that do not harden or become adhesive.
10. No media, fiber or copper, shall be installed in lengths surpassing Standards based length requirements.
11. Wire and cable routing shown on the Contract Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project conditions.
12. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required. Record actual routing on as-built for all conduit larger than one inch.
13. Cables shall not be broken out of their jackets except within enclosures designed to support and protect cable breakouts, splices, and/or terminations.
14. Installation of all cabling shall be in accordance with all guidelines established by the product manufacturer and all referenced industry standards.

C. Unshielded Twisted Pair (UTP) and Shielded Twisted Pair (STP) Cable

1. All TCP/IP-based copper network cabling shall be Category 6 or Category 6A rated as noted and installed in conduit except within dedicated communications rooms. All communications raceway shall not contain any AC carrying conductors or non-associated communications network cables.
2. Refer to related specification sections for additional requirements related to Category 6 or 6A cabling types, and testing requirements.
    a. All network cabling located above accessible suspended shall be installed in dedicated conduits or cable trays, exposed cabling supported by the use of “J” hooks shall not be accepted.
    b. All horizontal data drops shall be terminated on Category-6 or 6A patch panels installed on the 19” equipment racks\cabinets.
    c. All data drops and backbone cabling installed above inaccessible ceiling spaces or areas containing no ceiling shall be installed in dedicated conduits. In no case shall cable be supported on ceiling tiles, T-bars, or tie- wrapped to any conduit or pipes.
        a) Category-6 or 6A cables shall not be cinched too tightly; all cable bundles at patch panel locations and in the field shall be VELCRO type strips only. Plastic wire ties shall not be accepted on any Category-6 or 6A cabling.
        b) Each horizontal cabling drop shall be a dedicated Category-6 or 6A cable and shall not exceed a maximum cable length of 295 feet (including slack and service loops).
        c) Communications drops installed inside walls shall be installed in dedicated conduit terminating in a junction box at the jack location.
        d) Cable and wiring shall not lay loose on ceiling tiles or grids. Cable must be supported in all areas. Bridle rings or tie-wrapped supporting methods are not acceptable. Conduit stub-ups shall extend to the cable tray.

e) Install all cabling parallel and perpendicular to building lines and follow building structure. Use cable support equipment/hardware recommended by the manufacturer and/or as herein specified.
f) Provide all terminations, cross-connects, wire management, surge protectors, etc. for a complete and operational system.
g) Any data communications system cabling installed exterior to the building and/or being routed from the facility to any remote location external to the project location shall be rated for the environment in which it is being installed.

d. Ensure that all communications systems cabling supports (conduits, support grips, cable trays, and termination patch panels) are fully installed before proceeding with cable installation.

D. Conduits/Raceway/Cable Trays

1. Provide conduit and raceway systems for all communications networks as indicated below. Refer to all related specification sections for additional conduit and raceway information.
   a. Exposed structure: Provide conduit run from each drop to the nearest communication room.
   b. Vertical cabling shall be installed in dedicated conduits and shall be supported between floors in closets or accessible locations; in no case shall any cable risers be unsupported.
   c. Cables entering all communications equipment rooms shall be supported with cable tray from entrance to rack/cabinet location as indicated on the contract drawings and/or herein specified.
   d. Wire basket cable tray system shall be provided in all corridors as indicated on the contract drawings and installed as herein specified.
2. All conduits/raceways shall be concealed and shall be installed above accessible finished ceilings and/or in walls. Any conduits/raceways installed in areas requiring installation to be exposed, shall be installed as tight as possible to ceilings and at right angles to walls/building lines and shall not obstruct any access hatches, equipment service panels, lighting or other equipment and/or devices. No exposed conduits/raceways shall be installed without prior approval of the Authority.
   a. Where conduits cannot be concealed above ceilings or in walls and must be installed in finished or public areas of the building, all conduits shall be finished wire-mold type raceways or approved equal. Finished wire-mold type raceways shall not be installed without prior approval in writing by the Authority.
   b. Where any equipment and/or junction boxes are installed above non-accessible finished ceilings, the contractor shall provide access hatches listed for the intended application. Access hatches shall be located so that service access to the equipment and/or junction boxes is unimpeded.

1) Access hatches shall not obstruct any equipment, service panels, lighting equipment, devices, or any architectural elements of the ceiling. At the time of submittals, the contractor shall submit all proposed access hatch locations for review by the Design Professional.

c. All conduits/raceways shall be supported in accordance with NEC requirements and referenced standards.

d. All conduits/raceways shall be installed in a manner that prevents tampering or removal when installed in areas exposed to the general population.
   1) Provide tamper-resistant installation utilizing “torx with peg” security-fastening devices for all conduits/raceways, equipment, devices and appurtenances in all areas accessible to the general population and/or areas subjected to tampering or vandalism.

e. Interior raceways shall be a minimum 1 inch unless otherwise noted. Exterior raceways shall be a minimum 1 1/4-inch. Size all raceways and install conductors in accordance with NEC requirements. Fill ratio shall not exceed 40 percent for indoor raceways or exterior raceways.
   1) EMT conduit with compression fittings may be utilized in all inaccessible ceiling areas unless otherwise restricted by code.
   2) Threaded Rigid metal conduit shall be used on all exterior applications, stub-ups and all interior areas where concealed conduit requirements cannot be met and are exposed to tampering or damage by the general population.
      a) All areas considered being of high risk due to the nature of the occupancy or the need to protect and maintain the integrity of the cabling shall be installed in rigid threaded conduits.

f. Conduit expansion couplings shall be furnished and installed in all areas where expansion/contraction of structure may occur in order to couple two sections of a conduit runs to support longitudinal movement. The contractor shall refer to architectural drawings for exact locations of all building expansion joints.
   1) Conduit expansion couplings shall be consistent with the size the conduit being installed, shall be steel electrogalvanized, and shall meet all environmental and seismic conditions.
   2) Expansion couplings shall be weatherproof and approved for use indoors or outdoors without an external bonding jumper.
   3) Expansion couplings shall be UL Listed and approved for use in wet locations.
   4) Expansion couplings shall comply with UL 514B, CSA 22.2 No. 18 3-12, NEMA FB1.

g. Outlet Boxes: shall be 4-11/16 x 4-11/16 x 2-1/8 inches deep with single gang reducer plate where required for all data outlet locations and single gang for wall mounted telephone locations.
   1) All outlet boxes shall be provided with single or dual gang device mud-rings flush to finished wall as required based on type and configuration of outlet and type of wall construction.

2) Use deep masonry boxes at masonry construction. T-Bar hangers or other appropriate mounting hardware shall be utilized to support boxes mounted in the ceiling.

E. Penetrations of Walls and Floors:

1. All wall/floor penetrations are to be sleeved and fire stopped with approved fire stopping material or sealant as applicable for the type of penetration. Coordinate all cable and conduit penetrations of building with all affected trades. Refer to all related specification sections for additional wall/floor penetration requirements.
   a. All penetrations of rated walls and floors shall be fire stopped in accordance with the ASTM and NFPA standards. Refer to related specification sections for additional requirements.
   b. Floor penetrations shall be sleeved with a minimum sleeve diameter of 4 inches. An additional penetration shall be provided for future use, sleeved, and capped and fire stopped as required.
   c. Coordinate size of wall penetration with conduit size, number of conductors. Comply with all NEC requirements.
   d. The fire rating of all penetrated walls, floors, and ceiling structures shall be strictly maintained. All penetrations shall be fire-stopped and sealed by the Contractor.
   e. Install fire-stopping in open penetrations and in the annular space of penetrations for fire rated barriers.
   f. Installation of fire-stops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
   g. Installation of all fire-stopping shall be in accordance with fire test reports, fire resistance requirements, acceptable sample installations, manufacturer's recommendations, local fire and building authorities, and applicable codes and shall be installed in a manner acceptable to the authority having jurisdiction.

3.6 ELECTRICAL POWER DISTRIBUTION

A. Existing UPS units shall be used.

3.7 TRANSIENT VOLTAGE SUPPRESSION

A. Transient Voltage Surge Suppression: All cables and conductors extending beyond building façade (except nonconductive fiber optic cables) which serve as communications, control, or signaling circuits shall be protected against Transient Voltage surges and have Transient Voltage Surge Suppression (TVSS) protection.

1. The TVSS device shall be UL listed in accordance with Standard TIA 497B installed at each end. Lighting and surge suppression shall be a multi-strike variety and include a fault indicator.

2. Protection shall be furnished at the equipment and additional triple solid state surge protectors rated for the application on each wire line circuit shall be installed within 914.4 mm (3 ft) of the building cable entrance. Fuses shall not be acceptable for surge protection applications. All inputs and outputs shall be tested in both normal mode and common mode to verify there is no interference at the minimum surge suppression test shall meet the following criteria.
    a. All system power supplies serving exterior system components or devices shall be provided with the appropriate transient surge suppression protection on both the line side as well as the load side.
        1) A 10-microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes shall be the minimum performance requirements. Provide surge suppression in accordance with all manufacturers requirements.
        2) An 8-microsecond rise time by 20-microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes shall be the minimum performance requirements. Provide surge suppression in accordance with all manufacturers requirements.
        3) Maximum series current: 2 AMPS. Provide units manufactured by Advanced Protection Technologies, model # TE/FA 10B or TE/FA 20B or approved equal.
        4) Operating Temperature and Humidity: -40 to 85 degrees C (-40 to 185 degrees) shall be the minimum performance requirements. Provide surge suppression in accordance with all manufacturers requirements.

3.8 GROUNDING AND BONDING

A. All electronic equipment, conduits, cable trays, racks/cabinets and cable shields shall be properly grounded and bonded in accordance with all requirements of ANSI/TIA 607 (most recent version), NEC 250 and IEEE 1100. Additionally, all communications space, IDF, and MDF room grounding and bonding shall be in accordance with all related specification sections and Motorola R56 Standards and Guidelines for Communications Sites (where Motorola radio equipment is installed).

B. The existing Airport Telecommunications Grounding System shall be utilized in all communications equipment rooms.

1. Telecommunications Bonding Conductors
    a. Telecommunications Bonding Conductors referenced in this section are not intended to be comprehensive. Reference ANSI/TIA-607 for more information on all telecommunications bonding requirements.

b. Ferrous metallic conduits containing bonding conductors for telecommunications shall be bonded, at each end of the conduit, directly to the bonding conductor, using a listed exothermic weld, listed irreversible compression-type connectors, or approved equivalent, or to the TMGB/TGB, using a grounding bushing and a minimum 6 AWG bonding conductor. The bonding conductor contained within the ferrous metal conduit shall not be twisted around and passed through the grounding lug on the ground bushing to bond the conduit.
c. The minimum included bend angle for all bonding conductors shall be 90°.
d. Bends of bonding conductors terminating at the TMGB or TGBs shall have a minimum inside bend radius of 8 inches.
e. bends of bonding conductors at all other locations shall be made with the greatest practical inside bend radius. The minimum bend radius of all bonding conductors other than those at the TMGB and TGB shall be 10 times the bonding conductor diameter.

2. Refer to related specification sections for any additional grounding and bonding requirements.

3.9 EQUIPMENT IDENTIFICATION

A. Identify all system control, component and equipment cabinets and racks using plastic laminate engraved (“lamicoid”) labels, or approved equal. Firmly affix to the panel, device, and/or component. Refer to all related specification sections for additional requirements.

B. Permanently label all horizontal and backbone cabling, conduit, pathways, pullboxes, junction boxes and enclosures.

1. Warning Tags: At each location where the fiber cable is exposed to human intrusion, it shall be marked with warning tags. These tags shall be yellow or orange in color, and shall contain the warning: "CAUTION FIBER OPTIC CABLE." The text shall be permanent, black, block characters, and at least 3/16" high.
    a) A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not more than five (5) feet. Any section of exposed cable which is less than five (5) feet in length shall have at least one warning tag affixed to it.
2. Provide typewritten circuit directories installed in 3-ring binders with transparent page protectors in each control and sub control cabinet and/or equipment rack.

3.10 MAINTENANCE & SERVICE

A. General Requirements

1. The Contractor shall provide all services required and equipment necessary to maintain all contractor-furnished communications systems associated with this project during the Warranty period.

a. Provide all necessary material required for performing scheduled adjustments or other non-scheduled work. Impacts on facility operations shall be minimized when performing scheduled adjustments or other non-scheduled work. Refer to Division 01 specification section for additional requirements.
b. The adjustment and repair of the communications systems shall include all software and firmware updates on all computers, servers, CPUs, terminals, devices, communications and data transmission media (DTM), facility interface processors, signal transmission equipment and processors.
c. Test, inspect, and service each system on a quarterly basis (three month intervals) during the warranty period from the time of final acceptance. The contractor shall compare quarterly test results with the test results at the time of final acceptance.
    1) The contractor shall include as part of the quarterly test the calibration and/or adjustment of any device, component, and/or system that has deviated from the original test results at the time of final acceptance.
d. For each quarterly maintenance period, provide written notification to the Authority of the systems condition before and after service, the exact components that were tested and serviced, and overall status of the system.

B. Personnel

1. Service personnel shall be manufacturer certified in the maintenance, testing, and repair of the type of system and equipment provided for the project. Provide the Authority the name of the designated service representative, and of any change in personnel.
    a. The Authority shall be provided copies of system manufacturer certifications for all designated service representatives.
2. Schedule of all work to be performed during regular working hours, Monday through Friday, excluding federal holidays.

C. Emergency Service

1. The Authority shall initiate service calls whenever the system is not functioning properly. The Contractor shall provide the Authority with an emergency service center telephone number. The emergency service center shall be staffed 24 hours a day 365 days a year. The Authority shall have sole authority for determining catastrophic and non-catastrophic system failures.
    a. For catastrophic system failures, the Contractor shall provide same day eight (8) hour service response with a defect correction time not to exceed sixteen (16) hours from arrival on site. Catastrophic system failures are defined as any system failure that the Authority determines will place the facility(s) at increased risk.
    b. For non-catastrophic failures, the Contractor within 1 business day with a defect correction time not to exceed 48 hours from time of notification.

D. Records & Logs

1. The Contractor shall maintain records and logs of each task and organize

cumulative records for each component and for the complete system chronologically. A continuous log shall be submitted for all devices. The log shall contain all initial settings, calibration, repair, and programming data. Complete logs shall be maintained and available for inspection on site, demonstrating planned and systematic adjustments and repairs have been accomplished for the system.

E. Work Request

1. The Contractor shall separately record each service call request, as received. The record shall include the serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing the action taken, the amount and nature of the materials used, and the date and time of commencement and completion.
2. The Contractor shall deliver a record of the work performed within five (5) working days after the work was completed.

F. System Modifications

1. The Contractor shall make any recommendations for system modification in writing to the Authority. No system modifications, including operating parameters and control settings, shall be made without prior written approval from the Authority. Any modifications made to the system shall be incorporated into the operation and maintenance manuals and all related documentation.

3.11 WARRANTY

A. Warrant material and workmanship for a period of at least one (1) year. Warranty period shall be longer if specified in related specification sections, or if provided by the furnished product's manufacturer. The warranty period shall commence from the date the Contactor received written notification of final acceptance from the Authority. At the minimum the contractor shall provide warranty provisions:

1. Warrant the replacement of defective components/materials and/or correct defective work when given notice by the Authority during the warranty period.
   a. At no time is the contractor to use the extra materials provided under the scope of this project to replace malfunctioning or damaged equipment and or components. The Contractor shall replace all malfunctioning or damaged equipment and or components with new. The repair and then reinstallation of malfunctioning or damaged equipment shall not be acceptable.
   b. During the Warranty period, replace failed equipment per the terms specified in this section. As such, the Authority shall not be bound to the terms and conditions of the manufacturer's warranty, pertaining to the replacement of failed equipment. In any situation, it is the Vendor's responsibility to keep the system operational during any hardware or software failures. Replacement equipment shall be provided to maintain operations while equipment manufacturer addresses warranty issues.
      1) Warranty replacements and repairs shall include any necessary shipping, handling and materials.

c. Establish a single point of contact for the Authority and provide any coordination responsibilities with manufacturers, suppliers, or contractors to resolve warranted issues and on all maintenance and service actions related to items included in the Warranty. Process and procedures for engaging technical support shall be developed and communicated to the Authority, or Authority Vendor.

2. Warranty excludes liability for consequential incidental, or special damages due to vandalism, misuse, or acts of god.
3. Onsite warranty response time by qualified technician shall be no more than 8 hours upon receipt of request from Authority, unless otherwise noted in related Division 27 specification sections.
4. Warranty repairs shall be provided to the Authority at no cost. This shall include but not limited to replacement of all defective components/materials, all labor charges, all travel costs and all vehicle charges.
5. Response time shall be 7 days a week / 24 hours a day / 365 days a Year.
6. Provide test, inspection, and service of each system on a semi-annual basis at six month intervals.
7. Contractor must provide verification that they maintain their principal base of operation along with the personnel that will be responsible for providing service within 3 hours driving time to the project site. This tenet of the warranty shall remain in effect for the life of the warranty.
8. All TCP/IP-based communications systems cabling and related appurtenances shall be provided with the manufacturer’s 25-year extended warranty in addition to all requirements above.

B. The Contractor shall, as a condition of final payment, execute a written warranty certifying all contract requirements have been completed in accordance with all requirements of the Contract Documents.

1. All system testing, commissioning, demonstration and training shall be performed prior to final system acceptance. All defects or damages due to faulty materials or workmanship shall be replaced without delay, to the satisfaction of the Authority’s Representative, at the Contractor's expense.
   a. The contractor shall provide written documentation of test results and stating what was done to correct any deficiencies. The first inspection shall occur 90 calendar days after the acceptance date. The last inspection shall occur 30 calendar days prior to the end of the warranty.
   b. The warranty period shall be extended until the last inspection and associated corrective actions are complete. Where any equipment and/or labor covered by Contractor's or manufacturer's warranty, has been replaced, due to failure, the warranty period for any replaced equipment or restored work shall be reinstated for a period equal to the original warranty period, and commencing with the date of completion of the replacement or restoration work.
2. In the event any manufacturer customarily provides a warranty period greater than one (1) year, the Contractor's warranty shall be for the same duration for that component.

C. The Authority retains the right to use additional repair personnel as necessary to correct any warranty trouble calls and back charge the Contractor if the Contractor has been considered non-responsive to repair requests by the Owner.

3.12 SERVICES

A. In addition to all testing requirements as specified by Division 01 specification section and all related Division 27 Specification Section, testing of all systems, sub-systems and cabling infrastructures shall be provided in accordance with all requirements of this section.

B. Test all cabling to confirm that no grounds, shorts, sneak currents, RFI and EMI conditions exist prior to start-up and commissioning of all, components, devices, equipment and/or systems.

C. Before requesting a final inspection, the contractor shall perform a series of end-to-end installation performance tests. The contractor shall submit for approval by the Authority all test procedures to be employed, test result forms, and timetable for testing all copper wiring.

D. Acceptance of the simple test procedures discussed below is predicated on the contractor's use of the specified products including but not limited to, all Division 27 systems, sub-systems, system components, fiber optic cable, category structured cable, cross-connect blocks, patch panels, and outlet devices as specified by all related specification sections and installed in accordance the Contract documents, manufacturer’s recommended practices and all applicable codes, standards and industry practices. Acceptance of the completed installation for each system will be evaluated in the context of each of these factors.

E. Testing Requirements

1. Test Plan/Procedure: The Contractor shall provide six (6) hardcopies and an electronic copy of the test plan/procedures for each testing phase for the review and approval of the Authority. The test plan for each phase shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein. The test plan shall be provided at least forty-five (45) days prior to the scheduled start of each test. Test plans shall contain at a minimum:
   a. Functional procedures including use of any test equipment
   b. Test equipment is to be identified by manufacturer and model
   c. Interconnection of test equipment and steps of operation shall be defined
   d. Test records shall include test equipment serial number, calibration date and calibration certification of test equipment
   e. Expected results required to comply with specifications
   f. Traceability matrix referencing specification requirements with specific test procedures
   g. Record of test results with witness initials or signature and date performed
   h. Pass or fail evaluation with comments.
   i. The test procedures shall provide conformity to all specification requirements. Satisfactory completion of the test procedure is necessary as a condition of system acceptance.

j. The Contractor's Quality Assurance organization shall review all formal test procedures prepared by the Contractor and deliverable under the contract to assure the tests cover all requirements and that there is a conformity between the conducted test, the test results and specification requirements.

k. Documentation verification, both interconnects and functionality shall be part of the test. Where documentation is not in accordance with the installed system interconnect and operating procedures, the system shall not be considered accepted until the system and documentation correlate.

l. All testing must be witnessed by the Authority. The Contractor shall cooperate fully in this regard.

2. Test Reports: The Contractor shall prepare, for each test, a test report document that shall certify successful completion of that test. Six (6) hardcopies and one electronic version of the test report shall be submitted to the Authority for review and acceptance within seven (7) days following each test. The test report shall contain, at a minimum:
   1) Commentary on test results.
   2) A listing and discussion of all discrepancies between expected and actual results and of all failures encountered during the test and their resolution.
   3) Complete copy of test procedures and test data sheets with annotations showing dates, times, initials, and any other annotations entered during execution of the test.
   4) Signatures of persons who performed and witnessed the test.
3. Test Resolution: Any discrepancies or problems discovered during these tests shall be corrected by the Contractor at no cost to the Authority. The problems identified in each phase shall be corrected and the percentage of the entire system re-tested determined by the Authority, before any subsequent testing phase is performed.

F. Adjustment, Correction, and Maintenance

1. Make adjustments and corrections to system only after obtaining written approval of the Authority or authorized representative.
2. Perform required maintenance on systems including provision of replacement parts.

G. Final Inspection and Acceptance

1. Review tabulated records with the Authority.
2. The Contractor will not be responsible for failures caused by:
   a. Outage of main power in excess of backup power capability provided that automatic initiation of all backup sources was accomplished and automatic shutdowns and restarts of systems performed as specified.
   b. Failure of any Authority furnished power, communications, and control circuits provided failure was not due to Contractor furnished equipment, installation, or software.
   c. Failure of existing Authority equipment provided failure was not due to Contractor furnished equipment, installation, or software.

3. When performance of integrated system does not fall within the above rates, determine cause of deficiencies, correct, and retest.
   a. When requested by the Authority, extend monitoring period for a time as designated by the Authority or authorized representative.
   b. Submit final report of endurance testing containing all recorded data.
4. The Contractor shall submit written certification that:
   a. The Contract Documents have been reviewed.
   b. All required as-built documentation has been submitted and approved by the Authority.
   c. The Project had been inspected for compliance with the Contract Documents.
   d. The Work has been completed in accordance with the Contract Documents.
   e. The equipment and systems have been tested and are shown operational in the presence of the Authority.
   f. The Project is completed, and is ready for final inspection.

3.13 TRAINING

A. General

1. By means of training classes augmented by individual instruction as necessary, the Contractor shall fully instruct the Authority's designated staff in the operation, adjustment and maintenance of all products, equipment and systems. The Contractor shall be required to provide all training aids, e.g., notebooks, manuals. The Contractor shall provide an appropriate training area equipped with all required equipment. The location of the training area shall be coordinated with the Authority.
2. All training shall be completed a minimum of two weeks prior to system cut over. Training schedule shall support the various work shifts of airport and tenant personnel and shall be subject to the Authority approval.
3. Training shall be conducted by experienced and factory authorized personnel and supported by training aids. An adequate number and amount of training material shall be provided by the Contractor. The following is considered a minimum.
   a. Functional flow-charts, overall block diagrams, and descriptive material for all software;
   b. Schematic drawings for each of the hardware components;
   c. All procedure manuals, specification manuals, and operating manuals;
   d. Detailed as-built drawings.
4. Participants shall receive individual copies of technical manuals and pertinent documentation at the time the course is conducted. The courses shall be scheduled such that Authority personnel can participate in all courses (no overlap).
5. A final course schedule and syllabus shall be prepared by the Contractor for each course to be conducted for Authority personnel, and submitted for review at least four (4) weeks prior to the scheduled date of the course commencement.

6. Each course outline shall include, in addition to the subject matter, a short review of the prerequisite subjects (where appropriate); how this course fits into the overall training program; the objective; the standards of evaluation; and any other topics that will enhance the training environment.
7. Provide detailed video recordings in high quality digitally formatted media of all demonstration and training of all systems and system operations.
    a. Utilize remote microphones as may be required to ensure high quality audio of the recorded demonstrations.
    b. Permanently and professionally label all recorded materials and provide self-sealing plastic cases for each training session.
8. All training requirements identified are minimum requirements.

B. Types of Training

1. User Training: System users shall be instructed in all aspects of operations of the system, including the business intelligence tool and all reporting functions and shall conform to the following minimum requirements:
    a. Training classes shall be scheduled not less than 48 hours apart to allow The Authority's User/Operators to familiarize themselves with all system operations.
        1) Basic Training: Provide twelve (12) hours of basic user training shall be provided. User training shall be conducted at a location that is coordinated with the Authority.
        2) Advanced Training: Provide twelve (12) hours of advanced user training shall be provided. User training shall be conducted at a location that is coordinated with the Authority.
        3) System Administrator Training: System Administrator Training shall be provided. System Administrator Training shall include both classroom work and field training.
        4) Software/Operational Training: Provide twenty-Four (24) hours of software training.
2. The Contractor shall structure each training course to describe all systems, software and applications as well as support programs. This course shall include a functional overview of the complete software and operations of each system. The course material must be presented in depth by a factory authorized instructor and shall covering in detail at the minimum all system functions, features rebooting and maintenance criteria.
3. Provide operation, parts, and maintenance manuals defining operation and troubleshooting methods of all systems and review with The Authority's User/Operators as part of training demonstrations.
4. Provide detailed video recordings in high quality digitally formatted media of all demonstration and training of all systems and system operations.
    a. Utilize remote microphones as may be required to ensure high quality audio of the recorded demonstrations.
    b. Permanently and professionally label all recorded materials and provide self-sealing plastic cases.

3.14 PROJECT CLOSEOUT REQUIREMENTS

A. In addition to all final close requirements as specified by Division 01, Specification Section 270500 Specification Section, the Contractor shall comply with all requirements of this Section.

B. Final System Acceptance

1. In addition to the requirements set forth in Division 01, the Contractor shall prepare and issue a Certificate of Project Completion, containing:
   a. The date of project completion.
   b. A list of items that have been corrected by the Contractor.
   c. The time and date the Authority will assume possession of the system (transfer of ownership).
   d. The date that warranty begins.
2. The Authority will perform an inspection after receipt of written certification. The project completion inspection shall include, but not be limited to:
   a. The project's contracted work and any additional change orders.
   b. All equipment and systems tested and shown operational in the presence of the Authority.
3. After the inspection the Authority will prepare and submit to the Contractor, a list of items to be completed or corrected, as determined by the inspection, along with the designated timeframe for completion.
4. Should the Authority consider the work to be incomplete, the Authority will immediately notify the Contractor, in writing, stating the reasons. Upon receipt of such written notice from the Authority, the Contractor shall take all steps necessary to complete the work in a timely manner to minimize any impact to operations. Once the incomplete work has been completed, the Contractor shall prepare and issue a Certificate of Project Completion per the requirements set forth in this specification. The Authority shall then re-inspect the work upon Contractor's request at a scheduled re-inspection time.
   a. The written notice issued by the Authority will include a maximum compliance period, not to exceed 30 calendar days. The Authority, at its discretion, may define a compliance period which is shorter based on project needs, project schedule constraints or other extenuating circumstances. If the nature or complexity of the work required to comply with the written notice is such that it cannot be completed within the required compliance period, the Contractor shall immediately notify the Owner in writing. The notification from the Contractor shall include a detailed, resource-loaded schedule indicating when and how the work will be completed, subject to approval by the Authority. Until such a schedule is approved by the Authority, the original compliance period specified will stand.

b. If, at any time during the compliance period, the Authority determines that the Contractor is not progressing satisfactorily with the steps necessary to complete the work in a timely fashion, or if the Contractor fails to complete the work within the compliance period or by the completion date approved by the Authority, the Authority shall have the right to pursue liquidated damages and/or Contract with a third party in order to complete and/or inspect any work of which Contractor failed to conform with the Contract requirements. All costs associated with the Authority's actions to complete and/or inspect any work not conforming with contract documents shall be borne by the original Contractor responsible for delivering the project.

C. Inspections

1. At the completion of the project and prior to final acceptance of the Work, provide evidence of final inspections and approvals to The Authority, in accordance with all requirements of the Contract Documents as well as required by the authorities having jurisdiction.
2. Authority approval is required prior to final system acceptance and payment.

END OF SECTION 27 05 00

SECTION 27 42 16 - ELECTRONIC VISUAL INFORMATION DISPLAY SYSTEM (EVIDS)

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings, General Provisions, Supplementary Provisions, and Division 01 Specification Sections shall all apply to this Section. Should requirements within this Section conflict with Division 01, the Division 01 requirements shall govern.

B. The Electronic Visual Information Display System (EVIDS) described herein includes the requirement for the replacement of the existing SITA Airport Vision version 7. Base bid shall be an on-premise solutions with two alternates:

1. Alternate #1: Cloud-based solution in lieu of the base bid on-premises solution. Both base bid and alternate shall include all reoccurring fees for the first year after substantial completion.
2. Alternate #2: Content management add-on to the base bid to replace the Airport's current cloud based system (ScreenCloud) which drives the Airport's current 3x3 video wall and approximately 5 general displays.

C. The scope of work shall include all necessary reconnection, replacement, and new hardware with all software and licenses as required for a functional replacement. To minimize impact to operations a phased replacement is required. The RFP response shall include a detailed proposed phase replacement plan for review.

D. The EVIDS integrator shall be certified on the proposed system. The integrator/contractor is responsible for providing all required equipment, devices, system components, patch cables, programming and development of display contents, commissioning, and testing of all displays and equipment in accordance with work defined in this section, existing conditions, and related Division 27 Specification Sections.

1.2 RELATED DOCUMENTS

A. Related Specification Sections:

1. Division 27 - Investigation of Existing Communications Systems
2. Division 27 – Common Work Results for Communication Systems
3. Division 27 – Public Address System

B. Reference Symbols:

1. All device symbols are defined by the appropriate symbol schedule on the symbols and abbreviations sheet in the systems drawing package. Not all device symbols indicated may be required for the project.
2. Due to the scale of the drawings, symbols are shown on drawings as close as possible to the mounting location. Contractor shall coordinate exact locations with all drawings and affected trades prior to submittal of shop drawings.

C. Abbreviations:

1. Refer to Specification Section 27 05 00 for additional information.

D. Definitions:

1. Refer to Specification Section 27 05 00 for additional information.

1.3 SCOPE OF WORK

A. Refer to Specification Section 27 05 00 in addition to the following.

B. Refer to drawing sheet TA0-002 for the work responsibility matrix regarding the scope of work required for the Electronic Visual Information Display System.

1. Where listed on the responsibility matrix, the following line components shall be defined as follows:
   a. Headend Hardware: The Authority shall furnish and install all required headend hardware and equipment.
   b. Headend Software: The Contractor shall furnish and install all required software for the associated existing headend equipment, including programming of the additional displays.
   c. Network Components: Utilize existing components.
   d. Horizontal Cable: Utilize existing cabling.
   e. FIDS Displays and DDC: Utilize existing (or provided by the Airport) components.
   f. FIDS DDC Software: The Contractor shall furnish and install all required software for the associated existing DDC equipment.
   g. FIDS Workstations Hardware: Utilize existing equipment and replicate existing functionality.
   h. FIDS Workstations Software: The Contractor shall furnish and install all required software or web access with the same functionality as on the existing system.
   i. Tug Input Devices: The Contractor shall furnish and install replacements to existing devices as required.
   j. Data Interface with Airlines: Contractor shall furnish and install replications of all existing airline interfaces. Contractor to replicate current interface functionality in the new system.
   k. Data Interface with PA System: The Contractor shall furnish and install all necessary equipment and software for interfacing with the new PA system. Contractor to replicate current interface functionality in the new system.
   l. Data Interface with CUTE System: The Contractor shall furnish and install all necessary equipment and software for interfacing with the existing CUTE system (Collins Areospace CMuse). Contractor to replicate current interface functionalilty in the new system.

C. Additionally, the contractor shall provide the following as part of the EVIDS scope.

1. The Contractor shall provide comprehensive project management services for the coordination of its team members and the Authority during the term of the project.
2. The Contractor shall be responsible for coordinating installation requirements with all affected trades and the Authority.
3. The Contractor shall provide Quality Assurance to ensure that the installed system meets or exceeds every standard set forth in these specifications, in coordination with the Authority.

4. Construction scheduling and tasks required to support project phasing, relocations and temporary operations for airlines and public use of the facilities.

1.4 REFERENCES

A. Refer to Specification Section 27 05 00 for requirements.

1.5 SYSTEMS DESCRIPTIONS

A. Refer to Specification Section 27 05 00 for additional information.

1.6 SUBMITTALS

A. Refer to Specification Section 27 05 00 for additional information.

B. Product Data Submittals

1. Contractor furnished items shall not be procured prior to the Contractor receiving a product data submittal response for said items stamped by the Engineer as “accepted as noted” or “no exception taken”.

1.7 QUALITY ASSURANCE

A. Refer to Specification Section 27 05 00 for additional information.

1.8 DELIVERY STORAGE AND HANDLING

A. Refer to Specification Section 27 05 00 for additional information.

1.9 RECORD DOCUMENTS

A. Refer to Specification Section 27 05 00 for additional information.

1.10 OPERATIONS AND MAINTENANCE

A. Refer to Specification Section 27 05 00 for additional information.

1.11 SOFTWARE AGREEMENT

A. Refer to Specification Section 27 05 00 for additional information.

1.12 EXTRA MATERIAL

A. One (1) Tugman input device

B. One (1) device of any additional active hardware required for the replacement of the current system.

PART 2 - PRODUCTS

2.1 MANUFACTURED PRODUCTS

A. Refer to Specification Section 27 05 00 for additional information.

B. Approved EVIDS/FIDS software manufacturers:

1. SITA
2. Infax
3. SimpleWay
4. Flyte Port

5. Or pre approved equal meeting all project requirements for a base bid on-premises solution or cloud based alternate solution. Pre-approved equal will require a demo to the Airport.

2.2 EVIDS DISPLAY TYPES AND CONFIGURATION REQUIREMENTS

A. EVIDS Display Requirements:

1. General:
   a. The Contractor shall coordinate with the existing structural, power, millwork, the Authority and the existing EVIDS system to plan locations, attachments, accessibility, and operations for each display/element to be connected to the new system.
   b. All display hardware types LCD/LED flat panel displays and LED signs are existing and shall be reconnected to the new system with the same functionality and showing the same content as the existing system.

2.3 SYSTEM AND SOFTWARE REQUIREMENTS

A. General Requirements

1. The project shall replace the existing EVIDS running on the existing system software. The displays and processors planned reused and/or new in the project shall require provision of software, software licenses, programming new display media and contents and integration with other system.

B. Software

1. Provide software as required for a complete replacement of the existing system.

C. Software Licenses

1. Include software licenses for all software included in the project scope, valid for a minimum of 1 year from activation of EVIDs displays, or as defined in Division 1 of overall project.

2.4 HARDWARE REQUIREMENTS

A. General

1. The EVIDS, as defined in this document, shall include all configured hardware and software as required for a complete replacement of the existing system. The Contractor shall supply any new patch cables, power cords, displays, display mounting attachment hardware, and other as necessary to interconnect all system components. All new hardware and materials provided under this project shall be new and covered by the manufacturer's warranty.

B. EVIDS hardware products shall include, but not be limited to:

1. LCD/LED flat panel video displays:
   a. Utilize existing
2. DDC flat panel media players:
   a. Utilize existing Lenovo M90n-1 Think Centre – Type 11AE running Windows 10 Pro.

b. Coordinate installation of all new DDC software installation with the Airport.
c. Airport will provide a unit for use in the new Operations Center location.

3. LED Bag Claim Signs:
   a. Utilize the two existing red LED displays to be reconnected to the new system. Provided new ethernet/serial converters if required.
4. Tugman input devices:
   a. Provide touchscreen POE powered devices that are fully compatible with the proposed system. Proposed units shall have functionality as the existing units being replaced.

PART 3 - EXECUTION

3.1 COORDINATION

A. Refer to Specification Section 27 05 00 for additional information.

3.2 EVIDS PROGRAMMING SYSTEM EXPANSION AND DISPLAY CONTENT

A. The Existing EVIDS system shall be replaced to include all EVIDS devices as indicated in the project drawings. The replacement will require networking as well as systems configurations and contents development for each display type and quantity indicated in the project drawings.

3.3 EQUIPMENT PROTECTION

A. Protect all materials, equipment, devices, or components permanently installed and/or stored on the job site. Protect all materials, equipment, cabling, devices, or components during construction and after installation, provide appropriate protection of all materials, equipment, components and/or devices until time of substantial completion. All materials, equipment, components and/or devices shall be protected during shipment and storage against any physical damage, dirt, moisture, cold, snow or rain:

   1. During installation, enclosures, racks\cabinets, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of any foreign matter; and shall be vacuum cleaned both inside and outside before testing and operating and repainting if required.

3.4 WORK PERFORMANCE

A. In addition to the requirements of Specification Section 27 05 00, comply with the following:

   1. Refer to related Specification Sections for additional project coordination requirements. In addition to the requirements defined in this Specification Section, the contractor shall coordinate and meet all requirements addressed in Division 1 and all 27 Specification Sections.

3.5 EQUIPMENT INSTALLATION

A. All system equipment installations shall be in accordance with good engineering practices, NEC, local building codes, and all manufacturer's requirements. Cable terminations at all equipment locations shall comply with all state and local electrical codes. All wiring shall test free from all grounds, shorts, stray voltages, and EMI.

3.6 INSTALLATION REQUIREMENTS

A. In addition to all demonstrations and training as specified by Division 01, Specification Section 27 05 00 and related Division 27 Specification Sections, system installation shall be provided in accordance with all requirements of this Section.

B. General

1. System/Hardware and mounting must comply with IBC Seismic Requirements.
2. Where undefined by codes and standards, Contractor shall apply a safety factor of at least 2 times the rated load to all fastenings and supports of system components.

3.7 EVIDS CABLING REQUIREMENTS

A. While existing can be reused, for any new elements or rework as required provide and install complete EVIDS cabling, including but not limited to:

1. Power cords
2. CAT6 /6A Patch Cables (blue in color).
3. HDMI video cables
4. Any other cables required for equipment functionality. Building backbone and horizontal cabling is existing to be reused. Coordinate with Airport IT as required.
5. Refer to Specification Section 27 05 00 for additional information.

3.8 ELECTRICAL POWER DISTRIBUTION

A. Comply with the requirements of Specification Section 27 05 00.

3.9 TRANSIENT VOLTAGE SUPPRESSION

A. Comply with the requirements of Specification Section 27 05 00.

3.10 GROUNDING AND BONDING

A. Comply with the requirements of Specification Section 27 05 00.

3.11 EQUIPMENT IDENTIFICATION

A. Refer to Specification Section 27 05 00 for additional information.

3.12 MAINTENANCE AND SERVICE

A. Refer to Specification Section 27 05 00 for additional information.

3.13 WARRANTY

A. Refer to Specification Section 27 05 00 for additional information.

3.14 FIELD SERVICES

A. Refer to Specification Section 27 05 00 for additional information.

3.15 TRAINING

A. Refer to Specification Section 27 05 00 for additional information.

3.16 PROJECT CLOSEOUT REQUIREMENTS

A. Refer to Specification Section 27 05 00 for additional information.

END OF SECTION 27 42 16

SECTION 27 51 16 – PUBLIC ADDRESS SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Related Specification Sections:

1. Division 27 – Investigation of Existing Communications Systems
2. Division 27 – Common Work Results for Communications Systems
3. Division 27 – Electronic Visual Information Display System

B. Reference Symbols

1. Because of the scale of the drawings, PA system integration, and connectivity objects are shown on drawings as close as possible to their existing mounting locations. Contractor shall coordinate the exact location of all systems, system integration, and network connectivity, with all related drawings, Specification Sections, and affected manufacturers, prior to submitting any shop drawings.

C. Abbreviations and Definitions:

1. Refer to Specification Section 27 05 00 for additional information.

1.2 SUMMARY

A. Refer to Specification Section 27 05 00 in addition to the following.

B. This Section includes design requirements for the replacement of the Authority's existing public address system (SITA Airport Voice v5.0.1). This new system shall be extended into the New Terminal project under a different contract. The replacement system shall include all functionalities of the existing system including the interface with the existing fire alarm system for muting and data interface with the EVIDS/FIDS that is also being replaced under this contract.

C. The scope of work shall include all necessary reconnection, replacement, and new hardware with all software and licenses as required for a complete and functional replacement. To minimize impact to operations a phased replacement is required. The RFP response shall include a detailed proposed phase replacement plan for the Authority's review to minimize impact to the operational Airport.

1.3 SCOPE OF WORK

A. Refer to Specification Section 27 05 00 in addition to the following.

B. Refer to drawing sheet TA0-002 for the work responsibility matrix regarding the scope of work required for the system.

C. Where listed on the drawing responsibility matrix, the following components shall be defined as follows.

1. Headend and Software: Contractor shall furnish, install, and program all required headend equipment and software including but not limited to licensing, system expansion, redundancy, workstation licenses, operating software license or any other software required to replace the existing system.

2. Amplifiers: Contractor shall furnish and install new amplifiers using existing speakers and cabling.
3. Network Components: Utilize existing components.
4. Horizontal Cabling: Utilize existing horizontal cabling.
5. Non-dedicated PAS Workstations Hardware: Utilize existing equipment.
6. PAS Workstations Software: The Contractor shall furnish and install all required software on any existing workstations and/or same functionality via web access.
7. Speakers: Utilize existing speakers and cabling.
8. Paging Stations: The Contractor shall furnish and install replacements for all existing paging stations, as required, using existing cabling. Provide new units at all new locations as noted in the drawings.
9. Ambient Sensor Microphones: The Contractor shall furnish and install replacement sensors for the existing ambient, as required, using existing cable.
10. Data Interface with FIDS: The Contractor shall furnish and install all necessary equipment and software for a bi-directional data interface with the EVIDS/FIDS system that is also being replaced as part of this project. Contractor to replicate current interface and functionality in the new system.
11. Hardwire Interface with Fire Alarm: The Contractor shall furnish and install all necessary equipment and software for interfacing with the existing fire alarm system.
12. Background Music Interface: The Contractor shall connect to the Airport's current music source.

D. Drawings, General Provisions, Supplementary Provisions, and Division 01 Specification Sections shall all apply to this Section. Should requirements within this Section conflict with Division 01, the Division 01 requirements shall govern.

1. The intent of this specification is to establish a standard of quality, configuration, and operational requirements for the replacement of the Airport's existing Public Address System. It shall be the responsibility of the successful Contractor for the furnishing of all necessary system designs and installation, in accordance with the requirements of the contract documents.
2. PA shall provide the integration with the fire alarm for muting of PA background music and announcement in the event of a fire alarm condition. The existing PA/FA interface occurs in the Scan room and shall be replicated into the new system.
3. This section includes but is not limited to battery backup power unit, controllers, servers, software, licenses, power amplifiers cages, power amplifier cards, microphones/paging stations, interfaces, and ambient microphone necessary to deliver a complete replacement of the existing public address system and all of its functionality.
4. In addition, the scope of work shall include but is not limited to all system components, active electronics, conduits, and cabling to deliver a properly installed, fully operational system at all locations in accordance with all requirements of the Contract Documents.

5. The functional integration of the various systems shall include the capability to provide remote annunciation and control functions as herein described. Refer to the Contract drawings for additional information regarding system types and locations.
6. It shall be the Contractor's responsibility to become familiar with all existing conditions, system configurations, and program functions of the existing system prior to the commencement of any work. Refer to Specification Section 270105 for investigation requirements of the existing system prior to any work.
7. The installation, performance, features, functions, software, and programming criteria, as specified herein, as well as all related Specification Sections, has been designed to offer the maximum system efficiency, ease of operation, occupant safety and the protection of equipment.
    a. Any deviations from the specified criteria shall be documented, reviewed, and agreed to in writing by the Owner prior to submission of bids. Refer to Division 01, and all related Specification Sections for product substitutions.
8. Future capabilities: While not part of this replacement project the system shall be capable of having the following features to support the New Terminal project where this system shall be expanded:
    a. The system shall be capable to perform voice evacuation, where the system takes audio signal from the Fire alarm system and distributes the voice evacuation messages thru the PA speakers. Amplifier components shall, at a minimum, be listed or recognized UL 864 and UL 2572.
    b. The system shall have logical outputs available (one per new gate) to be used to control the LED color at the new terminal gate houses. POE I/O modules such as the AtlasIED model 1522LR will be needed for the new terminal projects. These outputs will be used to activate upon 'boarding status' at each gate. Outputs can be triggered from the PA boarding process activation or via the FIDS data interface when the gate status changes to 'now boarding'.

1.4 REFERENCE STANDARDS

A. Refer to Specification Section 27 05 00 for additional information.

1.5 SUBMITTALS

A. Reference Specification 27 05 00 in addition to the following.

B. In addition to all "Submittal" requirements specified in Division 01, Specification Section 27 05 00 and all requirements by related Specification Sections, the Contractor shall also conform to all requirements of this section.

1.6 QUALITY ASSURANCE

A. In addition to all "Quality Assurance" requirements specified in Division 01, Specification Section 27 05 00 and all requirements by related Specification Sections, the Contractor shall also conform to all requirements of this section.

1. Contractor's Qualifications:

a. Firms regularly engaged in the installation of Audio Paging and Announcement systems of a similar scale and complexity and that have three (3) years of installation and programming experience with systems like that required for this project. The Contractor shall have been actively engaged in installing, maintaining, and operating similar systems and services by the approved manufacturer as outlined in this document. Two (2) of these references shall be an Airport.
b. Provide references to include client names, phone numbers, and a summary of project details. These references will be checked, and the clients will be asked questions relating to the performance of your company.
c. Provide verification that installation personnel responsible have been properly trained to install the products described in this Section.

2. Manufacturer's Qualifications:
   a. Firms regularly engaged in development of products of the types and capacities required for this project; whose products have been in satisfactory use in similar service for not less than three (3) years.
3. All work shall be performed in accordance with the applicable manufacturer's installation instructions, and requirements. In addition, all work, testing, and commissioning shall be in conformance with all requirements of the Contract Documents, applicable Codes and Standards, as well as all requirements of the following authorities having jurisdiction:
   a. City of Des Moines, Iowa.
4. Coordinate all operational provisions of the system, programming and operational features and functions.
   a. Prior to finalization of any programming the Contractor shall review, with the Authority, and Owner's Representative, the following:
      1) System integration methodologies
      2) All audio paging functions
      3) Fire Alarm Interface requirements
      4) Background music Interface requirements
      5) EVIDS/FIDS data interface requirements
      6) All system configuration, monitoring, and troubleshooting functions
      7) Utility screens, user interface screens, on-screen operator functions
   b. Failure to provide this review, prior to final programming, shall result in the Contractor making all changes requested by the Authority at no additional cost to the project.

1.7 RECORD DOCUMENTS

A. Provide the Owner with a complete set of record drawings, in accordance with all requirements of Division 01 and Specification Section 27 05 00.

1.8 INTELLECTUAL PROPERTY

A. Refer to Specification Section 27 05 00.

1.9 SOFTWARE AGREEMENT

A. In addition to the requirements found in Division 01 and Specification Section 27 05 00, the Contractor shall also conform to the requirements of this section.

1.10 EXTRA MATERIAL

A. One (1) of each type of paging microphone and one (1) of each paging station's mounting adaptors such as surface mounted and/or desktop kits

B. One (1) Ambient Microphone Sensor

C. One (1) Intelligent Amplifier frame

D. One (1) dual channel 600watt amplifier card

E. One (1) dual channel 300watt amplifier card

F. One (1) dual channel 150watt amplifier card

PART 2 - PRODUCTS

2.1 GENERAL

A. The basis of design of this system is the architecture and equipment as provided by Innovative Electronic Designs (ATLASIED) and is not intended to restrict bidding to a particular contractor. The names and descriptions provide for specific component functions and the architecture is a networked distributed scheme intended to provide maximum flexibility and high performance. Different system architectures may be proposed if it can be proven to provide same or better features, performance, operational effect of equipment failure, flexibility for future expansion, and a successfully installed base in International airports. Contactor shall include all costs for differences in hardware, cabling, and conduits caused by different system architectures. This shall include allowances for architect and consultant fees for review and changes in documentation as well as cost impact to other trades to accommodate a change in architecture or installation techniques.

B. Provide all necessary system components, servers, and software in conformance with the performance requirements of these and all related Specifications. The system shall be provided in accordance with manufacturers' recommendations to meet all system performance criteria, configured to provide a user-friendly operating platform in a seamless manner.

1. Acceptable products:
   a. AtlasIED Global Com
   b. Or pre-approved equal with demo to the Airport

2.2 SYSTEM EQUIPMENT

A. Ambient Analysis Sensor – The Ambient Analysis Sensors shall detect ambient noise levels in respective speaker zones. Noise levels shall be processed using an A-weighted curve and converted to a DC waveform for transmission to an input on the T112 Series Amplifier with integrated ambient analysis system.

1. The ambient sensor shall be AtlasIED 540S or pre-approved equal.

B. Integrated Digital Power Amplifier System (IDPAS) – The Integrated Power Amplifier System shall provide DSP processing and power amplification for up to (12) zones in a single modular mainframe.

1. Digital Audio Network Interface – The network interface shall receive (12) dynamic assigned audio channels from the GCK Controller via the Ethernet Network. Control for the IDPAS and monitoring shall be included on the network. The NIC shall provide dual outputs to support a redundant network.
2. Zone Manager – The IDPAS shall provide zone management for (12) channels as directed by the ACS. Channel management shall be structured to utilize the minimum channels necessary on the network to support paging, messaging and background music activity for any combination of zones.
3. DSP Processing – The IDPAS shall include digital signal processing for (12) channels of audio. Each channel shall include (9) bands of parametric equalization, time delay, ambient analysis control, (7) monitoring points, and (7) testing points. Complete setup and control software shall be integrated within the GLOBALCOM 3.0 Software and available on the network for configuring, controlling, monitoring, and testing the DSP for each channel.
4. Ambient Analysis and Control – The Ambient Analysis System shall adjust signal levels in response to either ambient noise levels or computer commands. The system shall operate in real time and shall not be a “sample and hold” system. The system shall include an automatic calibration sequence. All setup, configuration and monitoring controls shall be software based with the ability for multiple sensors averaged to control a single channel(s) or for a single sensor to control multiple channels. The sensors shall utilize control signaling and levels that allow co-locating with the speaker cable for cable routing efficiency. Three modes of operation shall be possible:
    a. Automatic – Changes attenuation levels in response to noise levels reported by remote sensors.
    b. Slaved – Changes attenuation levels based on remote sensors of an automatic channel.
    c. Fixed attenuation as set by the computer and user.
5. Automatic Backup Amplifier Switching - The 7th power amplifier slot shall be reserved for automatic backup amplifier switching. A matching amplifier card shall be installed as a hot spare amplifier in the event of failure of one of the primary amplifiers. The system shall detect a failure of an amplifier card and shall electronically replace that amplifier without loss of service. Switching shall result in no loss or change of source or destination routing. Detection and switching shall take place in less than 2 seconds. A failure shall be reported immediately to the fault logging system.
6. Internal Monitoring – Each amplifier shall include in internal audio monitoring buss with software selected switching. This monitor shall allow selection of a monitor point from the control software to allow visual and audio monitoring of the channel network input, channel direct input, ambient channel output, EQ output, amplifier input, amplifier output, and speaker load monitor for each of the (12) channels. This feature shall operate simultaneously and independent of the automatic testing.

7. Automatic Testing – The automatic testing system shall locally test and process audio test signals through the amplifier. These tests may be done manually on demand for any single test point as well as globally in the mainframe on a completely automated basis during the day. The test points duplicate those of the monitoring points above with a testing resolution of 0.5 dB.
8. Local Inputs – The IDPAS shall include (12) analog inputs for local zone program sources or BGM. One channel shall be configurable as a backup emergency input usable in the event of a network failure.
9. The integrated digital power amplifier system shall be AtlasIED Titan One T112 or pre-approved equal.

C. Power Amplifier Cards – Each amplifier mainframe shall be designed to accept (7) amplifier cards. Each card shall be removable and replaceable without disabling or interfering with the operation of the DSP or other power amplifier cards. The amplifier cards shall be dual 150-watt minimum, 70-Volt cards and shall be of a high efficiency design to maintain a minimum of 78% efficiency at 100% output. The mainframe shall support simultaneous use of (6) amplifier cards (12) channels) plus the hot spare card. Contractor shall include 1 spare paging amplifier sized to the highest wattage configured for auto-switch over upon failure of any primary amplifier.

1. Provide appropriate card models as required.
2. Power amplifier cards shall be AtlasIED TitanOne compatible, or pre-approved equal. Refer to design drawings / schedules for type and quantities to replace the existing amplifiers.

D. Full Function Microphone Communications Stations – Full function communication stations shall have a touch screen color graphical LCD. The station shall be a network appliance with control and Dante audio communicating on the audio network. Connection to the system shall be 100BaseT with power provided by a PoE switch port. Microphones shall be provided as handheld. Each microphone shall utilize a magnetic mount and include a line amplifier in the microphone shell to eliminate microphone signal levels beyond the microphones. Stations shall support landscape and portrait orientation to support replacing existing stations. Stations shall be provided in surface, flush, or desktop mount configurations as noted on the drawings and based on the mounting situation required.

1. AtlasIED 571D, or pre-approved equal.
   a. Desktop kit AtlasIED 571MK-DT
   b. Surface kit AtlasIED 571MK-S

E. Announcement Controller – The GLOBALCOM IP Announcement Controller shall manage all primary operations of the ACS including paging communication stations, audio routing, message management and Ethernet communications. It shall include an on-board solid state hard drive as well as flash memory for fail safe emergency message playback. The Controller shall accept standard VoIP protocols via two (2) native, simultaneous connections, and shall accommodate eight (8) additional inputs when separate third-party media converters are included. The physical controller shall include GCK3.0 Controller Software. The Primary Controller shall be housed in the Scan room and a Secondary(Lifeline Controller) shall be housed in the N. IDF (Bldg 61).

1. GLOBALCOM IP232-D with GCK3.0 Software - 32 Channel Dante™ Sound, or pre-approved equal

F. PA database server should be hosted on the Airport's virtualized environment (primary and secondary). Database server shall provide the text to speech functionality (English only with other language available to be added later), web access, and used for FIDS interface requirements.

2.3 UNINTERRUPTABLE POWER SUPPLY (UPS)

A. Existing UPS units shall be utilized. Any exceptions or issues shall be identified during the investigation of existing system, refer to the 'Investigation of Existing Communications Systems' specification section.

2.4 NETWORK CONNECTIVITY

A. Network switches are existing, and all network connections and configuration shall be coordinated with the DSM IT department.

2.5 CONDUCTORS AND CABLES

A. All existing cables shall be reused where possible. Any required extension or new equipment connections shall be of the same type as field verified.

PART 3 - EXECUTION

3.1 EQUIPMENT PROTECTION

A. Comply with all requirements of Specification Section 27 05 00.

1. Examine all physical and environmental conditions, equipment and device locations, auxiliary system connectivity requirements impacting the installation of all network systems and report any unsatisfactory conditions in writing to the Owner's Representative.

3.2 WORK PERFORMANCE

A. In addition to all requirements as specified by Specification Section 27 05 00 the network communications systems shall also be provided in accordance with the following requirements:

1. Prior to the final commissioning and\or programming of any network communications components, the Contractor shall provide a review with the Owner's Representative addressing all network integrations, programming, phased replacement plan, and related operational connectivity.

a. Failure to provide this review and get final sign-off prior to programming shall result in any costs related to changes requested by the Owner's Representative as not being charged to the project.

3.3 EQUIPMENT/CABLE INSTALLATION AND REQUIREMENTS

A. In addition to all requirements as specified by Specification Section 27 05 00 the network communications systems shall also be provided in accordance with the following requirements:

1. All system cabling shall be of the type, size, and specification as required by all contract documents as well as stipulated by all codes and standards as specified by Specification Section 27 05 00.
   a. All network communications cabling shall utilize Category-6 UTP cables and installed in accordance with the requirements of Specification Section 27 05 00. All network cabling conduits shall not contain any AC carrying conductors or non-associated network communications cables within the cable raceways\conduits or cable bundles.
      1) In addition, all structured cabling associated with the installation of any network communications system shall comply with all requirements of EIA\TIA standards for the proper installation, termination and testing of all fiber optic and Category-6 UTP cabling.
      2) Contractor shall provide all equipment, components, devices, hardware, equipment and all appurtenances necessary to provide fully operational network communications systems utilizing a UTP cabling topography. Coordinate all structured cabling with all trades and contractors prior to shop drawing submission.
   b. All serial communications cabling shall utilize 16 AWG, 4 pair shielded twisted (STP) cables and installed in accordance with the requirements of Specification Section 27 05 00. All serial cabling conduits shall not contain any AC carrying conductors or non-associated network communications cables within the cable raceways\conduits or cable bundles.

3.4 TRANSIENT VOLTAGE SUPPRESSION

A. Comply with all requirements of Specification Section 27 05 00.

3.5 GROUNDING AND BONDING

A. Comply with all requirements of Specification Section 27 05 00.

3.6 EQUIPMENT IDENTIFICATION

A. Comply with all requirements of Specification Section 27 05 00.

3.7 MAINTENANCE & SERVICE

A. Comply with all requirements of Division 01 and Specification Section 27 05 00.

3.8 WARRANTY

A. In addition to all “Warranty” requirements as specified by Division 01, Specification Section 27 05 00 and all requirements by related Specification Sections the Contractor shall also conform to all requirements of this section.

B. Provide all manufacturers extended cable warranties based on matching wire to component compatibility requirements. All cable warranties shall be in effect for a period of not less than 20 years.

1. The warranty must include the following statements regarding the cabling system:
   a. "That all communications networks have been certified and will support and conform to ANSI/TIA-568-C specifications covering any current or future application which supports transmission over a properly constructed and horizontal cabling system premises network which meets the channel and/or basic link performance as described in ANSI/TIA-568-C."
   b. “That all communications networks are free from defects in material or faulty workmanship."

3.9 FIELD SERVICES

A. Comply with all requirements of Specification Section 27 05 00.

3.10 TRAINING

A. Comply with all requirements of Division 01 and Specification Section 27 05 00.

1. Documentation:
   a. Contractor shall provide documentation to include all test results and as-built drawings, test results shall be computer generated and shall include all trace reports indicating each pair tested in accordance with all requirements of Specification Section 27 05 00.
      1) One Hard Copy shall also be provided to the Owner’s Representative. Software for viewing the test results shall also be provided in the soft copy package.
2. As-Built Documentation:
   a. Contractor shall provide clean copies of the technology drawings depicting all as-built con for all data drop locations, cable routing and identification, patch panel, data switch port terminations, component layouts and all information as required by Division 01 Specification Section.

END OF SECTION 27 51 16